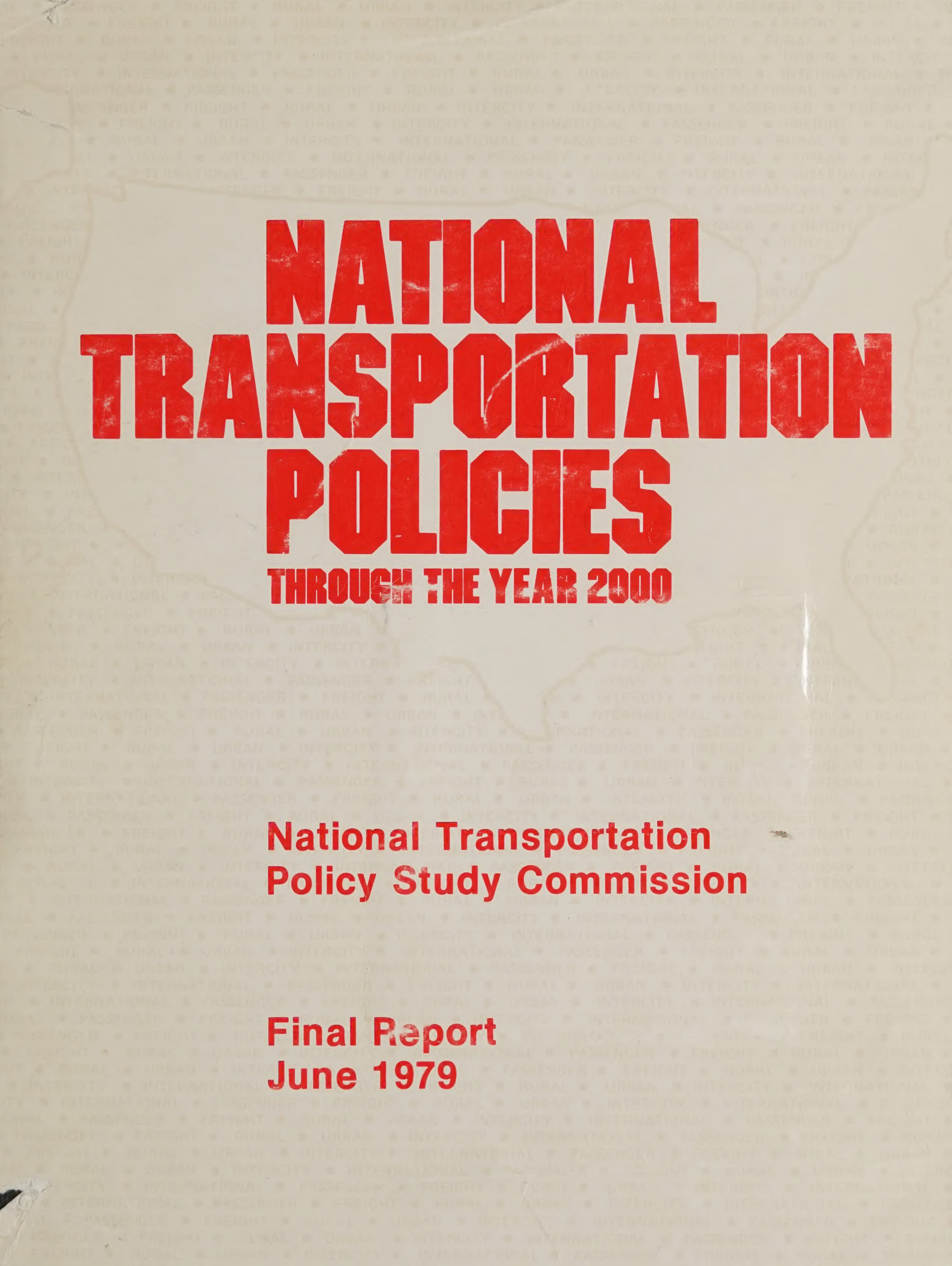

NATIONAL TRANSPORTATION POLICIES

THROUGH THE YEAR 2000

National Transportation
Policy Study Commission

Final Report
June 1979

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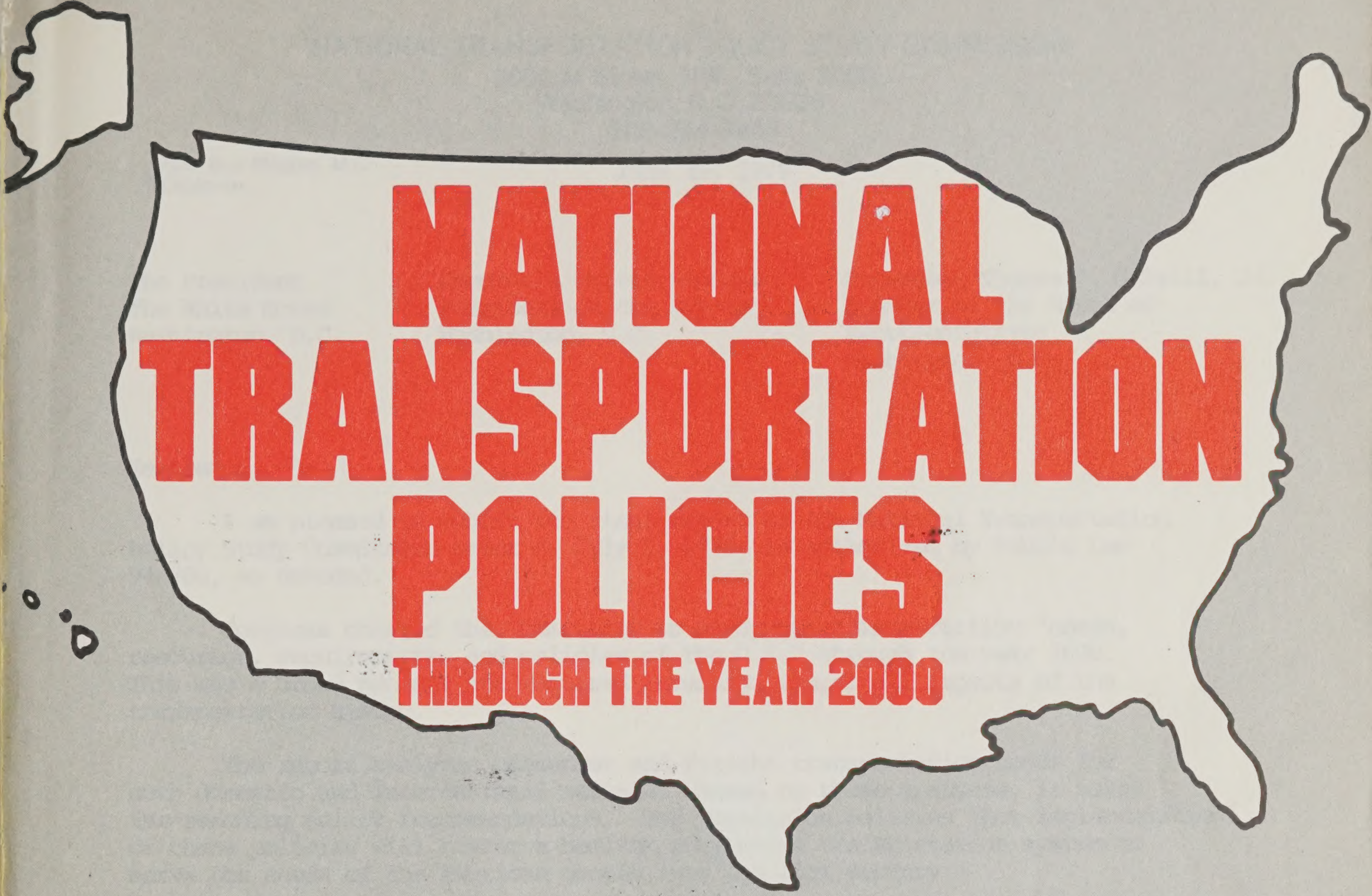

NATIONAL TRANSPORTATION POLICIES

THROUGH THE YEAR 2000

National Transportation Policy Study Commission

Final Report
June 1979

Chairman

Bud Shuster
United States Congressman
Pennsylvania

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NATIONAL TRANSPORTATION POLICY STUDY COMMISSION
2000 M Street, NW., Suite 3000
Washington, D.C. 20036
202-254-7453

Hon. Bud Shuster, M.C.
Chairman

June 25, 1979

The President
The White House
Washington, D.C.

Honorable Walter Mondale
President of the Senate
Washington, D.C.

Honorable Thomas P. O'Neill, Jr.
Speaker of the House of
Representatives
Washington, D.C.

Gentlemen:

I am pleased to submit the final report of the National Transportation Policy Study Commission prior to July 1, 1979, as authorized by Public Law 94-280, as amended.

Congress charged the Commission to study the transportation "needs, resources, requirements, and policies of the U.S." through the year 2000. This was a broad mandate and required investigation of all aspects of the transportation system.

The report analyzes passenger and freight transportation needs for both domestic and international markets. Based on these analyses, it makes far-reaching policy recommendations. The Commission believes that implementation of these policies will foster a healthy, responsive transportation system to serve the needs of the American people into the 21st century.

In submitting this report, I, as Chairman, would be remiss not to praise the efforts of my fellow Commissioners. Although they carry other heavy responsibilities, they responded to the additional duty of serving on the Commission with a commitment of time and energy that made this report possible. It is significant that the final report was unanimously adopted by a vote of 18 to 0, although, obviously, not every Commissioner agrees with every recommendation.

I respectfully submit this report and commend it to your consideration.

Sincerely,

Bud Shuster

BUD SHUSTER, M.C.
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Preface

The objective of the National Transportation Policy Study Commission (NTPSC) has been to formulate the broad outlines and primary themes of improved transportation policy for the United States. The Commission's recommendations are based on analyses and forecasts of the nation's needs and resources, taking into account the role of transportation in supporting national goals and shaping the lives and futures of American citizens.

The Commission's charter was mandated by Public Law 94–280, Section 154, of the 94th Congress (May 5, 1976),* which required: ". . . a full and complete investigation and study of the transportation needs and of the resources, requirements, and policies of the United States to meet such expected needs." Further, the NTPSC was to ". . . take into consideration all reports on National Transportation Policy which have been submitted to the Congress. . . ." It should evaluate the relative merits of all modes of transportation in meeting our transportation needs. . ." and ". . . recommend those policies which are most likely to insure that adequate transportation systems are in place which will meet the needs for safe and efficient movement of goods and people." The NTPSC's final report was to include its findings and recommendations with respect to—

1. the Nation's transportation needs, both national and regional, through the year 2000;
2. the ability of our current transportation systems to meet the projected needs;
3. the proper mix of highway, rail, waterway, pipeline, and air transportation systems to meet anticipated needs;
4. the energy requirements and availability of energy to meet anticipated needs;
5. the existing policies and programs of the Federal government which affect the development of our national transportation systems; and
6. the new policies required to develop balanced national transportation systems which meet projected needs.

To accomplish this set of tasks, the NTPSC's final report has been organized to begin with a chapter that presents base-line information on transportation activities and institutions as of the most current date. Then, in order to evaluate or recommend changes, it was believed essential first to understand present conditions of transportation in conjunction with the activities of governments. Accordingly, the second chapter provides material on present transport policies and programs of the Federal government (indicating their effect on the development of the national transportation systems), followed by a third chapter with similar information for state and local governments. Chapter 4 looks beyond the U.S. to compare and contrast transport policies of other developed countries with the U.S. situation. In

The NTPSC's charter also calls for findings and recommendations related to transportation needs through the year 2000. Therefore, it was necessary to project transport and other circumstances to that point in time; this task is described, first, in Chapter 5, which presents the three scenarios used by the NTPSC to bound future economic and social anticipations. Chapter 6 describes the technological changes specific to transportation and communications which are expected to affect transport markets to the year 2000. Chapter 7 deals with externalities, such as pollution and safety, that both proceed from transport forecasts and are likely to influence those forecasts.

The NTPSC's charter further calls for special attention to energy requirements and availability. In Chapter 8, energy demand and supply projections are presented, based on analysis of the likely production and consumption of energy in the U.S., calculation of transport's share of consumption, and review of how transportation will distribute energy commodities to the year 2000. That chapter displays extensive material on coal consumption and movement because coal is believed to be a primary energy source for the U.S. to the year 2000.

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*The Federal-Aid Highway Act of 1976, 23 U.S.C. 101 (1977), 90 Stat. 448.

The results of the NTPSC's forecasts of passenger and freight activity from the base year of 1975 to the end-point of 2000 are given in Chapter 9. As with much of the Commission's work, these data are presented by transport market, rather than by transport mode. The markets adopted concern rural, urban, intercity and international movements, further divided as to passenger or freight transport.

Because the NTPSC's charter indicates special concern about transportation "needs," Chapter 10 cites the projected capital requirements of the transportation demand forecasts. Although the capital estimates are based on the NTPSC's activity forecasts, additional material from a variety of sources about capital requirements was brought into the calculus. If new policies are not implemented, the activity forecasts of Chapter 9 and the capital forecasts of Chapter 10 indicate the nation's transportation "needs."

Chapter 11 places in perspective the various estimates to 2000 by indicating how the price of transportation and the use of resources in the transport sector are expected to differ compared with the base year 1975. For the 1975 to 2000 period, total U.S. transport expenditures are expected to equal from $11.5 to $14.3 trillion 1975 dollars, depending upon which national growth estimates are adopted. The chapter shows how constant-dollar government subsidy of transportation is also anticipated to rise, from $17.5 billion in 1975 to perhaps $70.8 billion in 2000, although national expenditures for transportation in the year 2000 are expected to comprise a smaller share of the gross national product (or of per capita disposable income) than was the case in 1975. However, levels of service are forecast to fall, with time spent in travel rising dramatically.

It should be noted that, to the maximum possible extent, all the NTPSC's forecasts were based on "status quo" policy assumptions.* That is, the estimates to the year 2000 assume the continuation of current 1979 policies (except where new policies are already established by law to be phased in at a later date). Such a "status quo" forecast was necessary for comparative policy analysis reasons—to be able to contrast the result of imposing new policies by the year 2000 with the situation if present policies were to continue.

On the basis of the NTPSC's forecasts, major issues were identified, as described in Chapter 12. In response to the NTPSC's legislative mandate, it was found that the nation will be unable to meet forecast "needs" to the year 2000, using current transportation systems, without declines in levels of transport service and increases in the resources devoted to transportation purposes. The issue is whether the U.S. desires to choose worsened service or the large expenditures necessary to continue present service levels. As to energy requirements and availability, the NTPSC found no lack of energy for transportation purposes, providing that the nation is prepared to pay the costs engendered. These costs involve not only money for the development of alternative energy technologies, and the transport of energy commodities, but environmental and safety costs of an uncertain magnitude. The issues surrounding the development of energy supplies and technologies are perhaps the most immediate concerns uncovered by the NTPSC's investigations.

The "proper mix of . . . systems to meet anticipated needs," involves an issue that, as cited in the NTPSC's legislation, forces the consideration of questions central to the development of new policies. Towards what mix of systems is present policy directing the U.S.? What are the consequences of that future mix? Is there a certifiable "best mix" of systems which policies might endeavor to achieve? What policies might achieve that "best mix?" How effective and efficient are such policies? Are there conflicts between measures that seek to achieve a "best" modal distribution and other values regarding freedom of choice and action?

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*The primary exception involved petroleum regulation, where the NTPSC made forecasts based on deregulation of energy prices.

Past U.S. transport policies have never confronted such questions directly. It is the finding of the NTPSC that an appropriate mix of systems is best achieved through promoting an environment of free choice, by consumers and suppliers of service, where prices fully reflect the monetary and non-monetary costs of that choice. Thus, certain basic themes supported by the NTPSC's investigation of transportation issues emerged. These include the importance of pricing mechanisms in competitive markets to determine transportation services required by the U.S. economy and the importance of neither distorting transport markets nor destroying the role of private enterprise when transportation is made a tool for achieving national objectives.

On the basis of forecasts, and the identification of emerging issues, the NTPSC Commissioners recommended ". . . new policies required to develop balanced national transportation systems. . . ." Six major policy themes were adopted, as presented in Chapter 13.

1. National transportation policy should be uniform;
2. There should be an overall reduction in Federal involvement;
3. Economic analysis of intended Federal actions should be used;
4. When the transportation system is used to pursue social goals, do so in a cost-effective manner;
5. Federal involvement in (including financial assistance for) transportation safety and research is required; and
6. Users and those who benefit from Federal actions should pay.

Based on these themes, NTPSC policies (as contrasted with status quo policies) were recommended in the functional areas of transportation: regulation; ownership and operation; finance, pricing and taxation; planning and information; and government organization. These new policies are designed to improve what is today a reasonably effective U.S. transportation system to meet the challenges with which it must cope through the year 2000. The policies encourage Federal action, in concert with the private sector and other levels of government, that are more consistent, flexible and cost-effective.

The impacts of the NTPSC's recommendations are discussed in Chapter 14, followed by Chapter 15 which suggests details of how the policies could be implemented. The concluding chapter summarizes the study and indicates specifically how the NTPSC's report responds to the mandates of P. L. 94–280.

The sixteen-chapter final report of the NTPSC, in conjunction with its published special reports, represents several departures from past national transportation policy investigations. The NTPSC's report is not only multi-modal, it is multi-market and deals with important influences external to transportation such as energy and communications. The NTPSC believes that national policy involves more than the actions of the national government and implies knowledge of the activities and contributions of other government levels and other institutions involved in transportation matters; special attention was therefore paid to state and local government roles. The NTPSC believes that much can be gained from reviewing the policies of other countries and gave attention to such investigations. Above all, the NTPSC's research was forward-looking, to discover the effect of today's policies in a changing world, so as to make sound and lasting policy revisions. For that reason, forecasts were made of energy conditions, transport activity and capital requirements. Finally, the NTPSC went to great lengths to analyze the impacts of its recommendations and to suggest how new policies might best be brought into action. It is appropriate to conclude that the outlook of the NTPSC is unique among transport policy reports in its breadth and detail of analysis.

Improved transportation policy for the United States is definitely in order. The report of the NTPSC recommends to the Congress and to the President the shape and extent of that policy. It is the hope of those who have produced this study that the recommendations will be carefully reviewed and acted upon to achieve an equitable and efficient use of transportation resources.

NATIONAL TRANSPORTATION POLICIES

THROUGH THE YEAR 2000

I

Transportation Activity and Institutions

Transportation Functions, Institutions, and Activity in the U.S.

1

THE FUNCTIONS OF TRANSPORTATION

Transportation supports fundamental economic and social activities. It involves the movement of goods and persons to bridge gaps in time and space.

Transport is pervasive, influencing business structure and location and allowing alternative consumer choices—alternative selections of living sites and offices, factories, schools, shopping centers, and places for recreation and entertainment. Improvements in transportation permit more participation in community activities, better communication with others located anywhere in the world, and more stimulation and enlightenment resulting from travel.

Improvements in transportation can facilitate economic growth through promoting economies of scale, increased efficiency, further specialization, and better use of expertise. Improved transportation can lower the costs of production and can increase competition among producers by expanding the area to which a given plant may distribute its products economically. Such competition may lead to lower prices and a wider choice of products for consumers.

The cost and quality of transport services also influence the effectiveness of government activities, such as mail delivery, emergency services, waste disposal, and national defense. Further, changes in transport services, along with utility service extensions, preferential taxation and zoning, can affect patterns of land use.

The positive functions of transportation should be weighed against its costs. To produce its services, transportation applies resources that otherwise would have alternative uses. Moreover, indirect costs result from supplying transport services. Transportation accidents can injure, maim, or kill. Transportation facilities or operations may spoil natural views, annoy with noise, pollute air and water, uproot or divide neighborhoods, encourage undesirable land use, and consume large amounts of nonrenewable resources. In addition, legal actions involving transportation may clog the courts. Substantial progress has been made in recent times to decrease such social costs. One purpose of this report is to recommend policy guidelines that enhance informed choices in the transportation field, considering both benefits and costs.

THE OVERALL SCOPE OF TRANSPORTATION IN THE U.S. ECONOMY

Annual expenditures for transportation in the U.S. have amounted to approximately 22 percent of the annual gross national product (GNP), equaling $416 billion in 1977. These expenditures are about evenly divided between freight and passenger transport.[1]

The recent trend has been for passenger travel to increase in relation to the GNP while freight movement per dollar of GNP declines. The U.S. economy is less and less oriented to heavy goods; extractive industries and heavy manufacturing have become less dominant while the service sector of the economy has gained in importance. In fact, the total tons moved by transportation has remained a relatively stable figure since 1972.[2] The average shipping distances of some commodities (such as fruits and vegetables, oil and coal) have risen, so the number of ton-miles of movement produced by transportation modes has grown slightly.[3] Passenger transportation expenditures—about 94 percent for user-operated forms (mainly automobiles) and 6 percent for purchased services (mainly air travel and urban transit)—have kept pace with other personal consumption expenditures in recent years at about 13.5 percent of total dollars spent. Passenger transportation expenditures have risen in number of dollars expended, however, from $58 billion in 1965 to over $172 billion in 1977.[4] (These figures do not include personal consumption expenditures for foreign travel in 1977 of about $10 billion or purchases of largely recreational goods such as bicycles, personal aircraft, and private boats, which exceeded $11 billion.)[5]

NATURAL RESOURCE USE

Transportation is a major consumer of resources. Among the important inputs to transportation are rubber, petroleum, steel, aluminum, and lead. Petroleum is the most significant of these in terms of public concern. Transport is approximately 97 percent dependent on petroleum for its operation and 53 percent of all petroleum consumed in the U.S. is used by transportation. More than 30 percent of that petroleum consumption is by automobiles.[6]

PERSONAL MOBILITY AND THE AUTO

Personal transportation by automobile is inextricably linked to contemporary American culture. Such measures as speeds and travel distances for personal trips have increased over the years, while simultaneously urban and suburban forms and structures have changed in accord with changes in mobility. Shopping patterns have shifted from short, frequent trips to longer, less-frequent ones, tied to the growth of large, centralized shopping centers. Increases in social and recreational travel, particularly eating out in auto-oriented fast-food restaurants, is one attribute of new life styles. Work trip length has grown and changed in direction and choice of travel mode.

TRANSPORTATION INSTITUTIONS

Transportation functions are performed by a variety of institutions, organizations, agencies, and individuals. These institutions, which can be separated broadly into private and public sector categories, influence how the transportation functions are performed. This first chapter initially highlights the institutions and organizations involved, noting their various roles; later sections of the chapter add to this discussion descriptions of the transportation facilities and services available to the nation, summarizing the levels of activity occurring in individual transport markets and on the various transport modes.

THE PRIVATE SECTOR

Consumers

U.S. citizens on the average spend over an hour per day traveling. More than 80 percent of U.S. citizens of eligible driving age possess driver's licenses, and air travellers totaled 280 million in 1978, with both figures on the increase.[7] In spite of this personal involvement, a large portion of the population does not belong to a transportation consumer organization. However, the membership of organizations like the American Automobile Association and the Aircraft Owners and Pilots Association is substantial. These organizations sell services, such as insurance, and represent the interests of their members in the political arena.

Firms

A compilation of the firms that produce and sell goods connected with transportation would be a major undertaking, so as not to omit any of the thousands of firms of differing sizes and types (e.g., mining, refining, manufacturing, construction, wholesale and retail sales, maintenance, services, operators, insurance, financing) directly or indirectly concerned with transportation. Private enterprise in its many forms predominates in the U.S. transportation scene, contrasting with the situation in many other countries. As to the purpose and provision of transport services, about two-thirds of the nation's total annual expenditures for transportation are made by individuals and small firms owning and operating vehicles.[8] These expenditures are made for the purchase of vehicles and parts, fuel, insurance, parking, maintenance and the like. The firms that directly serve these markets are generally relatively small and usually make retail purchases from larger wholesale or manufacturing firms. Certain of the manufacturers, such as General Motors, are among the world's largest firms. In some cases, these large manufacturers may distribute their products directly to private and government markets. As to the other third of U.S. transport expenditures, purchased services are provided by operators of all sizes in a variety of modal transport fields—such as transit, motor carriage, railroads, airlines, pipelines, waterways, and ocean shipping.

Those who produce and sell transportation tend to be well organized along trade lines. A large portion of the nation's transportation operators belong to national or regional trade organizations (such as the American Trucking Associations, Inc.). Other organizations of firms exist too: for example, the Motor Vehicle Manufacturers Association, the Railway Supply Institute, and the Aerospace Industries Association of America; all include manufacturers of transport vehicles. Those involved in constructing transportation facilities also generally belong to nationwide trade organizations. Those who produce and sell transportation are so thoroughly organized that they have established an organization of transport organizations, the Transportation Association of America.

Shippers are consumers of transportation, and sometimes producers of transportation as well. Many of them own and sometimes operate much of the transport equipment they use; others rely instead on carriers. Perhaps the largest and most influential shipper organization is the National Industrial Traffic League.

Labor

It is estimated that transportation directly employs about one of every nine persons in the nation's labor force,[9] including gas station and garage personnel and sellers of transportation equipment and related services. More than 93 percent of workers directly employed in transportation work in the private sector.[10] About half of all transportation employees work for filling stations, garages, and small firms.[11]

A large portion of the labor force of the commercial transportation industry (excluding gas station personnel and private owners and operators) belongs to unions. Labor union membership statistics vary widely depending on the sources and definitions used. Appendix Table 1 summarizes membership based on selections from a number of sources. Smaller transportation unions can wield power far in excess of their membership because other unions may honor their picket lines.

Early in their history most transportation unions represented workers in only one mode of transportation. More recently, some have broadened their scope to represent workers in two or more modes or workers engaged in occupations other than transportation.

In the rail and airline industries, labor union activity at the national level tends to predominate over local or regional activity. The Railway Labor Act, with its emphasis on a corporate system approach to organizing and bargaining, may have facilitated this development. Government policy seems to have favored national concentration of bargaining in the rail industry. Court decisions have been rendered against some unions seeking local bargaining rights, thereby forcing those unions to bargain nationally.[12]

Most transportation unions are craft unions (those that represent workers with a common skill, rather than workers with a common employer). In the railroad and airline industries, the governing law (The Railroad Labor Act) apparently encourages craft unions: union elections can only be held among a single "craft and class."[13] The National Labor Relations Act governs Federal labor activities in most other modes. That act is not "craft" oriented, but transportation tradition has resulted in craft unions for most modes. However, a trend exists toward broadening the membership of many unions so that more unions are an amalgam of both the craft and the industry type.

THE PUBLIC SECTOR

Governments have substantial influence over transportation, although they employ a small percentage of the nation's transport employees. Of the 766,000 government employees in transportation, the Federal government employs 75,000 in the U.S. Department of Transportation (DOT), and another 91,000 in the Postal Service. State and local governments employ 587,000.[14]

State and local governments fund the major portions of public transportation expenditures. Historically, Federal involvement in transportation focused on international and interstate transportation, but in the past two decades, it has become increasingly involved in local transportation as well.

Government involvement in transportation encompasses the construction and maintenance of highways, waterways, and airways; the ownership and operation of urban mass transportation services, intercity rail passenger service, plus air and marine navigation and traffic control facilities; the provision of flight information and air and marine search and rescue services; subsidy or other support for almost all forms of transportation; the formation and enforcement of rules of operation for public facilities and services; the establishment of economic, environmental, and safety-related regulations; research and development; and the negotiation of agreements with other nations.

INSTITUTIONS AND ACTIVITY IN THE LOCAL TRANSPORTATION MARKET

INSTITUTIONS—THE FEDERAL ROLE

The Federal government, though it does not generally own, develop, or operate local transportation, has a substantial influence upon it. The Federal government contributes to the financing of the nation's local highways and urban mass transportation (details are covered in Chapter 11).

It funds much of the planning related to development of public highways, airports, and urban mass transportation. As discussed in following chapters, the Federal government often conditions eligibility for the receipt of certain types of Federal program funds on the establishment of particular state or local agencies. In addition, Federal environmental and energy regulations may motivate local governments to promote modes which pollute less or are more energy efficient. Although the functions of Federal agencies are national in character, thus directly affecting most local transportation activity, the detailed discussion of Federal agency activities where the Federal role is predominant is presented in the intercity section of this chapter.

State Governments

State governments play a key role in transportation, providing many transportation facilities and services.

Further, because the powers of local governments derive from states, the transportation roles of local governments are influenced by state governments.

In order to be eligible for Federal highway funds a state must have a highway department or agency. All 50 states have established such departments and most have established Departments of Transportation. The nature and composition of state organizations vary, but all such agencies have responsibility for developing and maintaining some of the highways within their state. In addition, some of the departments have multi-modal planning and promotion responsibilities. In the past decade some states have become involved in funding airports, public transportation, and rail operations.

State highway and transportation officials have organized national associations including: the American Association of State Highway and Transportation Officials (AASHTO), and its affiliates; the National Association of State Aviation Officials and the National Conference of State Railway Officials; and the National Association of State Secretaries of Transportation. The National Governor's Association, the Council of State Governments, the National Conference of State Legislatures, and the National Association of Regulatory Utility Commissioners address transportation issues as part of their broader responsibilities.

Local Governments

In general, states are divided into counties or parishes, of which there are more than 3,100 in the United States.[15] In addition, thousands of communities are incorporated. The Bureau of the Census has terms to describe different types of areas. They include: places; municipalities and townships; urban-rural areas; standard metropolitan statistical and consolidated areas; and urbanized areas.[16]

The division of responsibility between state, county or parish, and incorporated communities varies over a wide spectrum. Additional complexity exists in states where the Federal government owns or exercises jurisdiction over major land areas (such as national parks, monuments, forests, and Indian reservations). In general, local governments regulate the use of public facilities within their jurisdiction (for example, highway speeds and parking laws), although they are sometimes subject to state or Federal guidelines. Some localities construct, maintain and service public transportation facilities; some sponsor, own, or operate public passenger transportation services. Some have taxing powers; others depend largely on funds provided by other levels of government.

In the 1960s and early 1970s, beginning with the Federal Urban Mass Transportation program, the Federal government began to allocate funds directly to local governments.[17] This has been a source of concern to some states.

A number of national associations have developed to serve the needs of local government officials. Organizations such as the U.S. Conference of Mayors, the Urban League, the National League of Cities and the National Association of Counties have broad interests including transportation.

Multi-Jurisdiction Agencies

The Federal government has fostered the establishment of multi-state regional organizations for the purpose of development planning. Transportation is one of the concerns of such organizations. The three major types of multi-state regional organizations are the Title V Commissions, the Appalachian Regional Commission, and the river basin commissions (plus such other multi-state river basin institutions as Federal-state compact commissions and interagency committees).

The eight Title V Commissions organized under The Public Works and Economic Development Act of 1965[18] represent about 60 percent of the land area of the U.S., along with a third of the nation's population.[19] Their focus is on industry, human resources, energy and energy conservation, natural resources, transportation, and tourism and recreation.

The problem of coordinating separate urban transportation systems in an urbanized area that extends beyond the boundaries of a single state has resulted in the formation of special-purpose interstate planning agencies. Through legislation enacted by each of the states in which the urban areas are located, these agencies have been assigned planning responsibilities for the entire multi-state urbanized area.

PASSENGER TRAVEL—URBAN AND RURAL

Local passenger travel uses both public and private vehicles. Transport using highways and highway vehicles is the largest component of this travel in the U.S. In fact, automobile purchase and operation costs constitute the largest element of the average household transportation budget.[20] Over 114 million automobiles are registered in the U.S., approximately one car for every two persons or 1.8 vehicles per household.[21] When the approximately 30 million trucks, 5 million motorcycles, and half million buses in the nation are added, there are over 150 million motor vehicles in the nation, mostly privately owned.[22] In 1975, for the first time, the number of vehicles in the U.S. exceeded the number of persons licensed to drive.[23] With the continuation of present trends, 90 percent of the eligible population could be licensed to drive by 1980.

The Highway System

Highway mileage has not grown dramatically over the years. In 1921 the center-line mileage of roads and streets in America was 3,160,000.[24] By 1975 the total had increased by only 21 percent to 3,838,000 miles.[25] (In the same period the population doubled and auto ownership increased 10 times.)[26] The major highway development has been improvement of the road system by paving, widening, and restructuring. A very small proportion of the mileage, generally representing the most developed highways, carries the vast preponderance of the traffic flow. The major functional categories used to classify roads are as follows:[27]

1. *Principal Arterials.* The network of high-volume facilities normally carrying long-distance travel. The Interstate System and other freeways and expressways are included in this category;
2. *Minor Arterials.* The network of routes providing access to the principal arterials, and supporting intercity flow to the principal system;
3. *Collectors.* An intermediate system of roads generally serving more localized travel; and
4. *Local Streets.* The lowest level in the functional classification, giving access to residences, farms and businesses.

Congress has established a Federal-aid highway system, primarily consisting of Principal and Minor Arterials, defined as follows:[28]

1. *Federal-Aid Primary System.* A system of connected main highways designated by each state subject to the approval of the U.S. Secretary of Transportation;
2. *Federal-Aid Secondary System.* A system selected by state highway departments and other appropriate local road officials that may include farm-to-market roads, rural mail routes, public school bus routes, local rural roads, access roads to airports, county roads and township roads, all subject to the approval of the U.S. Secretary of Transportation;
3. *Federal-Aid Urban System.* A system established in each urbanized area of a state, located to serve major centers of activity, subject to approval of the U.S. Secretary of Transportation; and
4. *The Interstate System.* A system established by Congress connecting principal metropolitan areas, cities, and industrial centers, to serve the national defense and to connect at suitable border points with Canada and Mexico.

Local Highway Congestion

Over the period from 1970 to 1975, total travel expressed as daily vehicle-miles of travel (VMT) increased faster than highway capacity.[29] Generally in the U.S., highway congestion worsened. Both rural and urban peak-hour speeds declined, meaning time spent in travel increased.[30] The actual congestion conditions as reported to the Federal Highway Administration by states for 1975 are illustrated in Figure 1 for urban areas. Maps in Figure 1 show that 40 percent of urban interstate and 41 percent of all arterial travel occurred at levels indicating some congestion. On a similar basis, 19 percent of travel on urban collectors occurred in congested conditions during peak hours.

Transit

Transit systems operate both by road and rail, serving approximately 5 percent of all local travel.[31] However, much of this travel is at peak rush hours in our major urban areas when people commute to and from work. Recent intensive investment in transit, particularly in large urban areas, has served primarily to arrest rather than reverse the long-term decline in transit's share of travel. If such public spending continues, some believe the long-term decline may be reversed.[32]

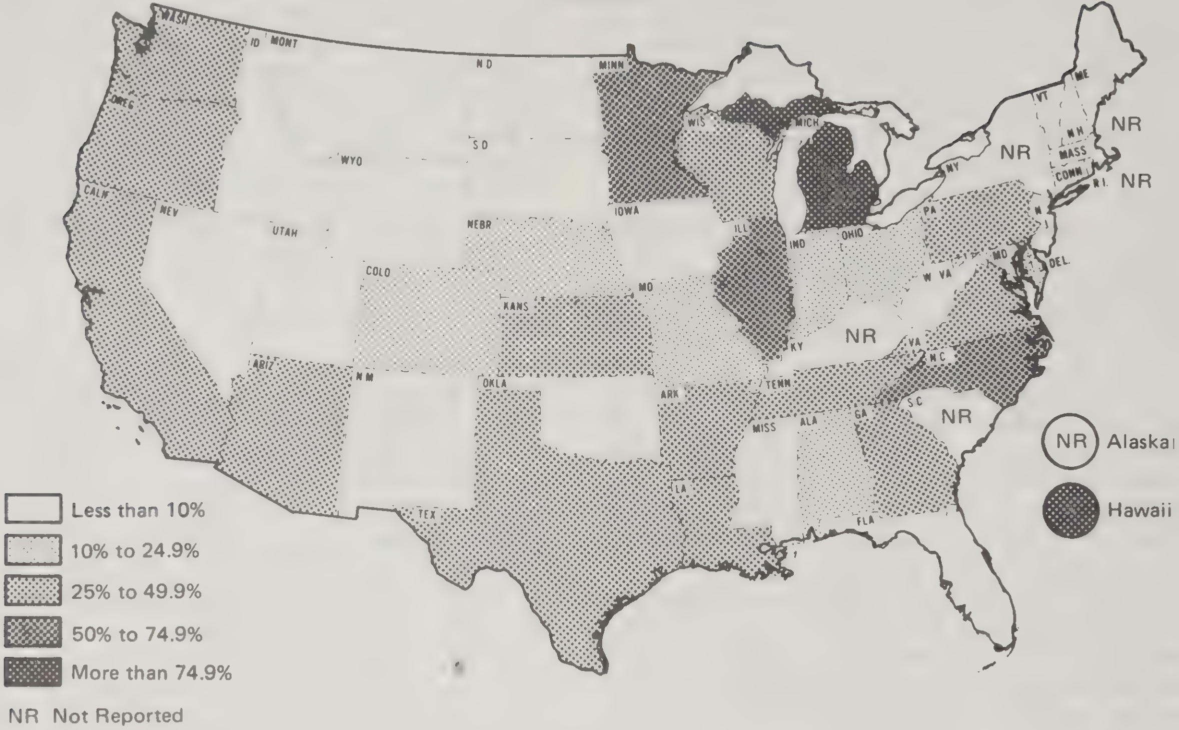
Transit services declined precipitously after World War II. From 1945 to 1975, transit ridership fell from 19 billion to under 6 billion passengers per year, yet fares rose so rapidly that transit revenues actually increased by 45 percent.[33] However, operating costs more than tripled in the same period.[34] What had been a profitable activity in the decade of the 1940s, incurred increasing deficits.[35] It was against this bleak picture of declining service and patronage that local, state and Federal agencies attempted to revitalize transit.

The first target often was to hold the line on transit fare increases in an effort to stem continuing ridership losses. Fares were stabilized by these efforts. On a current dollar basis there have been only slight fare increases from 1973 to the present.[36] On a constant dollar basis fares have actually declined in the same period despite substantial cost increases and inflation.[37] As a result, much of the cost burden has shifted from the farebox to the public treasury. In 1967 fares covered 96 percent of operating costs; this declined to 77 percent in 1972 and 53 percent in 1977.[38]

In conjunction with attempts to hold down fares, new programs have been tried to improve the quality and attractiveness of transit service as well as its availability. The effects of these programs are just becoming evident. The number of transit vehicles available for service has slowly increased since 1974, with the retirement of old vehicles and the expansion of fleets.[39] Deliveries of new vehicles jumped from the 3,500 per year range in the early 1970s to 5,500 per year since 1974, with most replacing outdated equipment.[40] Miles of service

FIGURE 1. Percent of congested[a] urban travel.

Interstate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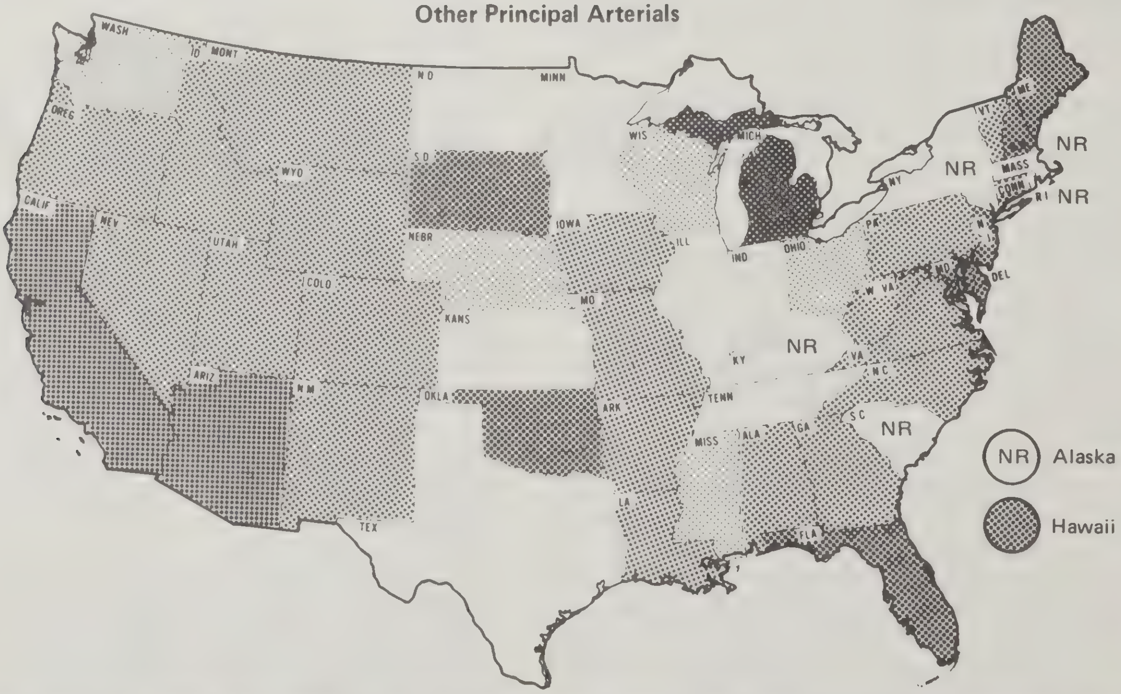
VA
ARIZ
NM
OKLA
TENN
NC
ARK
SC
NR
MISS
ALA
GA
LA
TEX
FLA
NR
Alaska
Hawaii
Less than 10%
10% to 24.9%
25% to 49.9%
50% to 74.9%
More than 74.9%
NR Not Reported

Other Principal Arterials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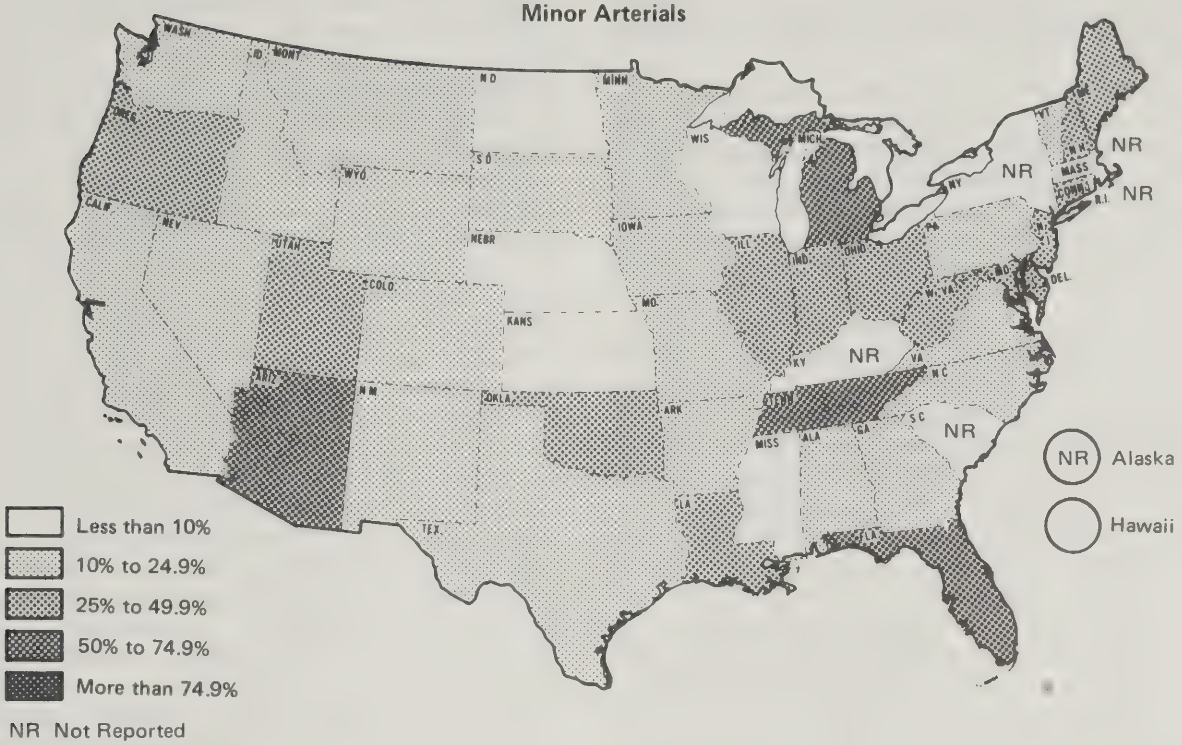
SC
NR
MISS
ALA
GA
LA
TEX
FLA
NR
Alaska
Hawaii

SOURCE: U.S. Congress, House, Committee on Public Works and Transportation, *The Status of the Nation's Highways: Conditions and Performance*, Report of the Secretary of Transportation, 95th Cong., 1st sess., Washington, D.C.: Government Printing Office, 1977, pp. 115–116.

[a] Peak hour volume-to-capacity ratio greater than 0.8.



Minor Arterials

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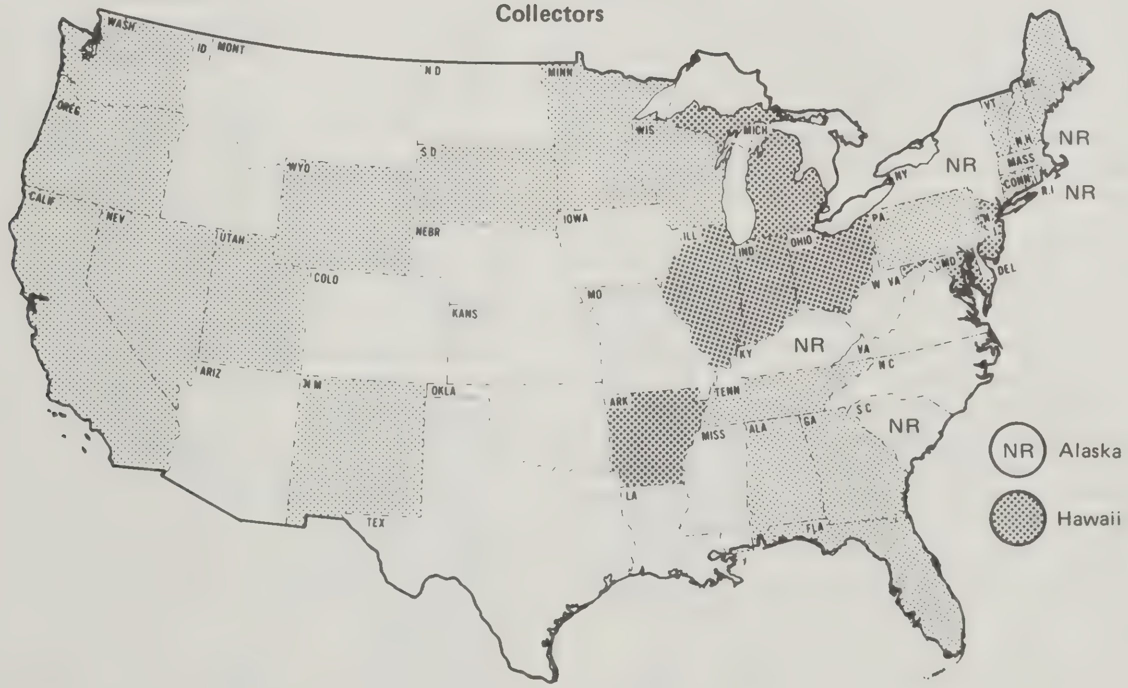
NR
MISS
ALA
GA
LA
TEX
FLA
NR Alaska
Hawaii
Less than 10%
10% to 24.9%
25% to 49.9%
50% to 74.9%
More than 74.9%
NR Not Reported



Collectors

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showed a similar reversal in trend in 1974 and have continued climbing.[41] As a result, both the vehicle fleet and miles of service have returned to the levels of 1960.[42]

Ridership has responded slowly to these improvements, increasing only sporadically since a large jump during the 1974 energy shortage.[43] As a result of greater urban dispersal in many cities, average journey lengths by transit have increased 50 to 100 percent since the early sixties,[44] meaning that transit users today travel farther at less cost per mile to the rider.

There have also been identifiable changes in public attitudes towards transit use. The Roper Organization has discovered as part of its continuing surveys a 20 percent increase since 1973 in the portion of the U.S. population that indicates transit is available to them for travel to work.[45] These surveys have also observed that, although the proportion of the population preferring to use transit for work has actually declined since 1973, it is still more than three times actual transit ridership.[46]

Transit service is highly variable from city to city. City size, age, and spatial form have all affected levels of transit service and utilization. Extensive transit service exists predominantly in cities that developed prior to the auto's ascendancy, and those cities still carry the great share of transit patrons today. Approximately 75 percent of all transit activity occurs in cities of over 2,000,000 people.[47] Almost all of the ridership decline from 1961 to 1976 occurred in cities under 500,000 in population.[48] In that same period, transit in the group of cities over 500,000 held steady or increased slightly in patronage.[49]

School Buses

Although rarely treated as one of its major elements, school buses are a component of the transportation system. Over 22 million students were transported to school at public expense in the 1975–1976 school year.[50] A fleet of approximately 300,000 vehicles provided this service at an estimated cost of slightly over $2.3 billion, or about $100 per pupil per year.[51] These vehicles are estimated to have traveled over 2.5 billion miles per year.[52] An important attribute has been the exemplary safety record of school buses, with fewer than 100 pupil fatalities registered in each year from 1974 to 1977.[53]

FREIGHT TRANSPORT—URBAN AND RURAL

Goods movement in local areas is of two distinct types. The first consists of shipments that are part of a larger intercity movement. This transport activity is covered primarily under the intercity freight section of this chapter. The second type of local freight movement involves the pickup and delivery of goods within a local area. Most local movements occur in trucks. Of the total truck fleet of over 28 million, approximately 8 million are in use for service or commodity transportation rather than for personal transport.[54]

Although 47 percent of national truck vehicle-miles are traveled on urban streets,[55] the urban sector claims a much smaller percentage of total ton-miles by truck[56] due to the smaller size of the typical truck in use in urban areas and the large proportion of the urban truck fleet used as service vehicles that do not transport goods. However, the fleet of goods-carrying urban trucks earns a larger-than-proportionate share of industry revenue. The Transportation Association of America (TAA) estimates that $54 billion of the total $110 billion paid to the trucking industry in 1976 went to local trucking.[57] This would place the earnings in local trucking at 50 percent of all trucking revenues and 37 percent of all U.S. freight revenues. Estimates place the level of expenditures for local trucking in rural areas at approximately $11 billion or 20 percent of the total $54 billion paid for trucking in 1976.[58]

Despite the large share of freight revenue involved, local trucking has been the object of little government interest or involvement. As a consequence, local goods movement appears both the least regulated and the least studied of transportation activities.

The portion of local freight related to intercity transport has two components. The first is the local leg of an intercity journey. One measure of the scale of the activity is provided by the 1973 Truck Survey published by the Federal Highway Administration. That survey established that truck trips representing 58 percent of all truck ton-miles had their destination in a Standard Metropolitan Statistical Area (SMSA) and 35 percent of all truck ton-miles was destined to the central city of a SMSA.[59] An additional 32 percent was destined to small cities between 2,500 and 50,000 population and 9 percent to rural areas.[60]

The second component of local goods movement related to intercity travel is the pickup and delivery of goods in the local area for consolidation into intercity shipments by other vehicles. It has been estimated that more than half of the 3.4 million tons picked up and delivered by trucks in SMSAs was for this purpose.[61]

The element of urban goods movement involving purely local movements accounted for the remainder of the tons moved. Of these movements, approximately two-thirds went from warehouse to retailers and factories and the remaining were deliveries from retail sites directly to consumers.[62] Of the 23 billion pickup and delivery stops, approximately 80 percent were by service vehicles, particularly refuse collection and mail.[63]

Local movements exhibit very different patterns depending on the commodities involved. Such patterns are determined by the frequency of stops made, the size of the shipments and the distances from home base to delivery. Delivery trucks with generally only one stop in a delivery area, such as trucks bringing material to a construction site, have all their miles attributed to the trip from base to zone (called stem driving). On the other hand, mail delivery vehicles have only 20 percent of their miles in stem driving and 80 percent in travel within the delivery area, called zone driving.[64]

Variations in the patterns of truck movement can have consequences for the cost of goods, fuel consumption, pollution and the contribution of trucks to street congestion. For instance, changes in stem-driving distances can appreciably affect congestion patterns. These trips typically occur in peak hours and use major arterials, while zone trips tend to be midday trips occurring on local streets. Reduction in stem mileage driven, as a result of the relocation of firms responding to new population patterns, can reduce congestion and delivery costs. More efficient delivery routes within zones, and increases in total shipment sizes, can have considerable effect on miles driven, fuel consumed, and total transport costs. Zone driving, involving perhaps 30 or 40 short pickup and delivery trips per truck per day, can cause much of the friction between cars and trucks in downtown areas during working hours.

High transport costs push producers and retailers toward fewer and larger shipments. Such pressures have contributed to the decline of home deliveries and small grocery and retail stores. The economies of large shipments to fewer sites have contributed to the growth of supermarkets and shopping centers. An effect has been to place the goods movement burden on the individual consumer, who is forced to travel greater distances to larger, more centralized facilities. Historically, shopping trips accounted for 7 to 8 percent of vehicle-miles of travel or over 100 billion vehicle-miles per year.[65] Shopping trips tend to be longest in rural unincorporated areas, and shortest in small cities, increasing in length with city size.[66]

Simple logistics applied to urban truck patterns reveals large-scale truck movement and freight cost reductions result from consolidation of shipments on delivery vehicles, better organized routing and scheduling and similar operation devices. Shifting truck delivery to off-hours or separate streets and better coordination with loading and unloading facilities have also been examined as ways of reducing congestion and costs.[67] On the other hand, there are benefits to the present system, such as name recognition and advertising on privately owned vehicles and greater control and flexibility in dedicated vehicles.

INSTITUTIONS AND ACTIVITY IN THE INTERCITY TRANSPORTATION MARKET

INSTITUTIONS—THE FEDERAL ROLE

Domestic interstate transportation falls into two general classes, depending on whether or not it is regulated by interstate transportation regulatory commissions. Regulated transportation accounts for about 20 percent of the nation's annual transportation expenditures (34 percent of nationwide freight expenditures, and 9 percent of nationwide passenger expenditures).[68]

The Federal government develops or owns and operates most of the nation's airways and waterways, and some roads on Federal lands. It also owns and operates the Alaskan Railroad and two Washington, D.C., airports. State and local governments own and operate the highways and most major commercial airports. Pipelines and railroads own their rights-of-way.

The Federal government has increasingly become involved in rail matters. The National Railroad Passenger Corporation (Amtrak) is directly subsidized by Congress and provides about 90 percent of the nation's intercity rail passenger service.[69] The Consolidated Railroad Corporation (Conrail) operates most of the rail freight service in the Northeast region of the nation. The Federal government organized this private corporation and financially supports it.[70] Federal laws recently passed have made available increased financial aid to private railroads (loans, loan guarantees, and stock purchases as well as grants to state governments faced with line abandonments).[71]

The trucking industry covers a broad distribution of firms—ranging from individual independent owner-operators to unregulated carriers of agricultural commodities to large common carriers regulated by the Interstate Commerce Commission (ICC). As shown in Appendix Table 2, the ICC classifies regulated motor carriers according to the nature of service they provide. These classifications are broken down in considerable detail based on the commodities transported and the type of carriage provided.

The railroads and motor carriers have each established groups of regional freight traffic bureaus to facilitate this process. The intercity bus industry has also established passenger bureaus for the same purpose. The ICC must approve the proposed rates before they become effective.

The intercity bus industry provides the most nearly ubiquitous service of all passenger common carrier modes, covering about 15,000 communities of which only 1,000 are served by other intercity common carriers.[72] Although the ICC regulates between 600 and 700 bus companies, two companies, Greyhound and Continental Trailways, have a large share of the intercity market, accounting for about 65 percent of the intercity bus passenger-miles.[73] Most other bus companies serve very limited regions of the nation.

U.S. aviation falls into three broad categories: general aviation, air carriers, and military aviation. The Civil Aeronautics Board (CAB) has held economic regulatory jurisdiction over air carriers (although economic regulation is now scheduled to be phased out of existence by 1985), including domestic and international "trunk" airlines, local service airlines, and supplemental air carriers. The trunks generally serve major intercity markets, and the local service airlines have served regional or short-haul markets. The supplementals are non-scheduled air carriers. Commuter carriers, which must use smaller aircraft than the trunks and local service carriers, provide scheduled service in short-haul markets and have not been regulated by the CAB. In addition, air carriers operating solely within the boundaries of one state are outside CAB regulation (although occasionally they are regulated by states).

The water transportation industry comprises three types of carriers: inland shallow-draft carriers, the Great Lakes and intracoastal shipping companies, and deep-draft ocean carriers which engage in international trade. A physical characteristic which differentiates these classes of water transportation is draft. Inland barges and towboats are normally restricted to shipping drafts of nine feet or less. About 1,850 commercial companies operate on the U.S. inland waterways, but about 10 percent of these are subject to ICC regulation.[74] The rest tend to haul exempt bulk commodities by barge. Great Lakes ships operate at drafts of no more than 25 1/2 feet, while ocean ships generally operate at draft of no less than 35 feet.

All shipping which occurs between U.S. ports must move in "U.S.-flag" (i.e., U.S. built, owned, and operated) ships.[75] This includes oceanborne trade between the mainland and the noncontiguous areas of Alaska, Hawaii, and Puerto Rico. There are many U.S.-owned ships registered under foreign flags of convenience. Under Section 902 of the Merchant Marine Act of 1936 these ships are subject to requisition for U.S. maritime support.[76] At the beginning of 1975 the ocean shipping industry was comprised of approximately 103 owners, 25 operators and 40 shipping agents.[77]

Few international marine carriers are subject to ICC regulation. In 1976, only five carriers were so designated. Their combined operating revenues were $1,583,281.[78] The Federal Maritime Commission (FMC) is the principal government agency that deals with commercial conduct of the international maritime community, being responsible for implementing Federal statutes that regulate both U.S. and foreign ships engaged in carrying import and export trade. FMC has the task of assuring the fairness of ocean freight rates and of competitive practices of carriers in the U.S. ocean trade.

The freight forwarding industry is also active in interstate and international freight movements. Shippers hire freight forwarders to organize and broker shipments, select carriers, and keep track of movements; certain forwarders act as shippers themselves. Some freight forwarders also provide or arrange pickup and delivery, packaging, warehousing, consolidation, financing, and insurance. Interstate freight forwarders are regulated by the ICC; international freight forwarders are regulated by the FMC; air freight forwarders are regulated by the CAB.

Currently, the interstate pipeline industry transports primarily oil, oil products and gas. Ownership of oil and oil-product pipelines falls into three categories: single ownership; joint venture; and individual-interest pipelines. There is one coal slurry pipeline operated in the U.S.

Most single-owner pipelines are owned by subsidiaries of oil companies. Oil companies tend to be both the owners and users of joint-venture pipelines. In general, joint-venture companies have been created by several parties interested in providing service to a specific region. Usually, these parties assume ownership shares in the venture in proportion to the throughput commitment each is willing to make. Individual-interest pipelines differ from joint-venture pipelines in that each of the several parties involved owns an exact share of the pipeline capacity. Each owner assumes responsibility for rates, regulations, throughput commitments and the like within his share. The recently completed Trans-Alaska Pipeline System has this type of ownership.

The institutional structure of natural gas pipelines differs from that of oil and oil product pipelines in that natural gas pipeline firms generally serve as facilitators or wholesalers in the natural gas industry. They purchase gas from producers and sell it to local utilities which distribute it to consumers. Because they own what they transport, they are not considered common carriers. They do not charge a customer a rate for transporting gas from one place to another.

Although gas pipeline companies purchase most of their gas from oil companies, nearly all major gas pipeline companies are financially involved with corporations which engage in exploration and drilling for natural gas. Gas producing companies are increasingly becoming subsidaries of the pipeline companies.

PASSENGER TRAVEL—INTERCITY

Intercity passenger transportation carriers have shown mixed trends in recent years. There have been service gains in the air and highway modes.[79] But there also has been declining service in the national rail and bus systems.[80] The situation today can be characterized as one of better service than in the past, but with fewer places where services (or significant choice of services) actually exist.

Total intercity passenger-miles of travel grew by 97 percent from 1960 to 1978, mostly on the nation's highways.[81] Significantly, the highway share of intercity passenger-miles has actually declined, from 90 percent in 1960 to 85 percent in 1978.[82] At the same time, the relative shares of rail and bus travel also declined, from 2.5 percent to about 0.3 percent for rail, and from 2.5 to less than 2 percent for intercity bus.[83] Air has been the great gainer, increasing five times in passenger-miles, and tripling its share of travel in the intercity market from 4 percent to over 12 percent.[84] Because of the expansion of air travel, the public-carrier share of intercity travel has grown, even as rail and bus declined.

The Passenger System

The highway system's significant component for intercity movement is the National System of Interstate and Defense Highways (the Interstate System). With more than 39,412 miles of the total 42,500 mile system open to traffic in 1978,[85] the Interstate System has become a leading conduit for intercity travel. The Interstate portion of the principal arterial network carries 20 percent of the U.S. vehicle-miles of travel in rural areas, using less than 1 percent of the rural road mileage.[86] All principal arterials (including the Interstate System) accounted for only 2.5 percent of rural miles of highways and yet carried 40 percent of travel in rural areas, including some local rural travel and the preponderance of intercity travel.[87]

BUS

The Interstate System also serves many of the approximately 1,000 bus companies that provide intercity service with a total fleet of 20,000 buses.[88] These buses run over a billion miles per year carrying approximately 330 million passengers.[89] Bus service operates in 15,000 U.S. communities with over 50,000 scheduled and flag stops.[90] It is estimated that virtually all communities over 5,000 in population have intercity buş service, as do 96 percent of communities between 2,500 and 5,000 in population.[91] For more than 14,000 of these places, bus is the only intercity public carrier service available.[92] In many, however, service levels have been declining, sometimes to as few as one bus per day.[93]

Charters and package express service have each grown from approximately 8 percent to 16 percent of bus revenues since 1960.[94] Charter bus rates are lower per mile than regular bus fares,[95] and offer groups of travelers direct, long-distance service.

RAIL

The decline of railroad passenger travel, on the other hand, has been slowed only by the infusion of public funds. In 1920, some 20,000 daily trains operated over a 226,000 mile network.[96] By 1970, when Amtrak assumed responsibility for most passenger rail operations, there were fewer than 300 daily departures, with yearly losses estimated at $252 million.[97] Amtrak has attempted to reverse this decline by restoring and revitalizing service. As of 1977, the Amtrak system, with 24,000 route-miles, served 532 places with 350 locomotives and approximately 2,000 rail cars.[98] Amtrak transports approximately 20,000,000 passengers annually.[99]

AIR

In 1960 air travel was 40 percent of the public carrier sector;[100] by 1978, air carriage doubled its share to more than 84 percent of public-carrier passenger-miles.[101] Because of longer average trip lengths, the air carriers' share of miles traveled exceeded their share of total passengers carried. Air travelers totaled 240 million in 1977, and reached approximately 280 million in 1978.[102] Approximately 58,000 city pairs were served by over 13,000 flights per day in 1977.[103]

The number of aircraft in certificated intercity service, approximately 2,200 in 1977, is not dramatically larger than the number of aircraft in service in 1960 and is actually smaller than the fleet in service in 1970.[104] The dramatic difference comes in the size and speed of the aircraft in use. The number of points served by trunk and local-service carriers has actually declined as those firms have withdrawn their operations from smaller communities, although commuter air carriers, using smaller aircraft, have often become replacements. In 1972, the last time an extensive inventory of the airport system was made, 93 percent of the U.S. population was within 30 minutes driving time of an airport and 86 percent was within 60 minutes of an airport with scheduled service.[105]

The general aviation fleet has also grown rapidly. Over 185,000 private aircraft used for business and recreation operate in the U.S.[106] They constitute the major portion of aircraft operations at most airports. In the 427 airports with Federal Aviation Administration traffic control towers, the distribution of the 67,000,000 aircraft operations conducted in 1977 was as follows:[107]

Air Carrier	15%
Air Taxis	5%
General Aviation	76%
Military	4%.

Activity and Levels of Use

By any method of counting and definition, the total amount of intercity travel is enormous. The TAA, which reports a consistently defined series of estimates on an annual basis, shows total intercity passenger-miles of travel to be over 1,440 billion miles in 1977 or roughly 7,000 miles per capita per year.[108] That would constitute about 2 1/2 hours of intercity travel for every person in the country each week, on top of the amount of time normally spent in local daily travel. Public carriers provide 14 percent of that travel, moving approximately 640 million passengers per year.[109] The changing distribution of passenger-miles of travel among the common carrier modes in the postwar period is shown in Figure 2 and Appendix Table 3.

Passengers travel for a variety of reasons. Visiting friends and relatives has been predominant, explaining almost 40 percent of all intercity travel, but in recent years other purposes have increased in proportion (see Appendix Table 4).

Changing demographic trends in the U.S. likely will continue to modify the amount and kind of travel in the intercity market. Among notable trends are the following:[110]

1. Expansion of industries and occupations with high travel potential, such as service industries and white collar occupations, will increase business travel faster than the general level of economic growth;
2. Increased affluence and more leisure time will stimulate pleasure travel and tourism;
3. Changing age distributions mean more persons in high-travel-potential age groups;
4. Having fewer dependents allows more time and disposable income for travel; and
5. The rising relative affluence of other countries will increase tourism to the United States, creating new demands on the intercity system.

Quality and Cost of Service

As the previous descriptions indicate, the U.S. today has extensive capacity for intercity passenger travel. Table 1 summarizes national service levels.

The system's great strength is ubiquity of service. Few areas of the U.S., and even a smaller proportion of the population, are beyond a reasonable access time to the two major intercity travel modes: auto on the Interstate and the scheduled air carrier. The bus system is similarly pervasive, providing access to even very small communities.

But trends in coverage indicate that service is becoming less pervasive, with reduced public carrier service to small communities. Statistics each year show fewer communities served, as carriers try to shift service toward more lucrative high-density markets.[111] The advent of an active and healthy commuter airline service system has helped to sustain service in small communities where trunk or local-service air carriers have withdrawn. Commuter carriers have often been able to increase service points and expand schedule frequencies as a benefit of using smaller aircraft. Overall, however, many of the communities identified as receiving bus or air service are receiving minimum service, i.e., one departure per day, or even less.

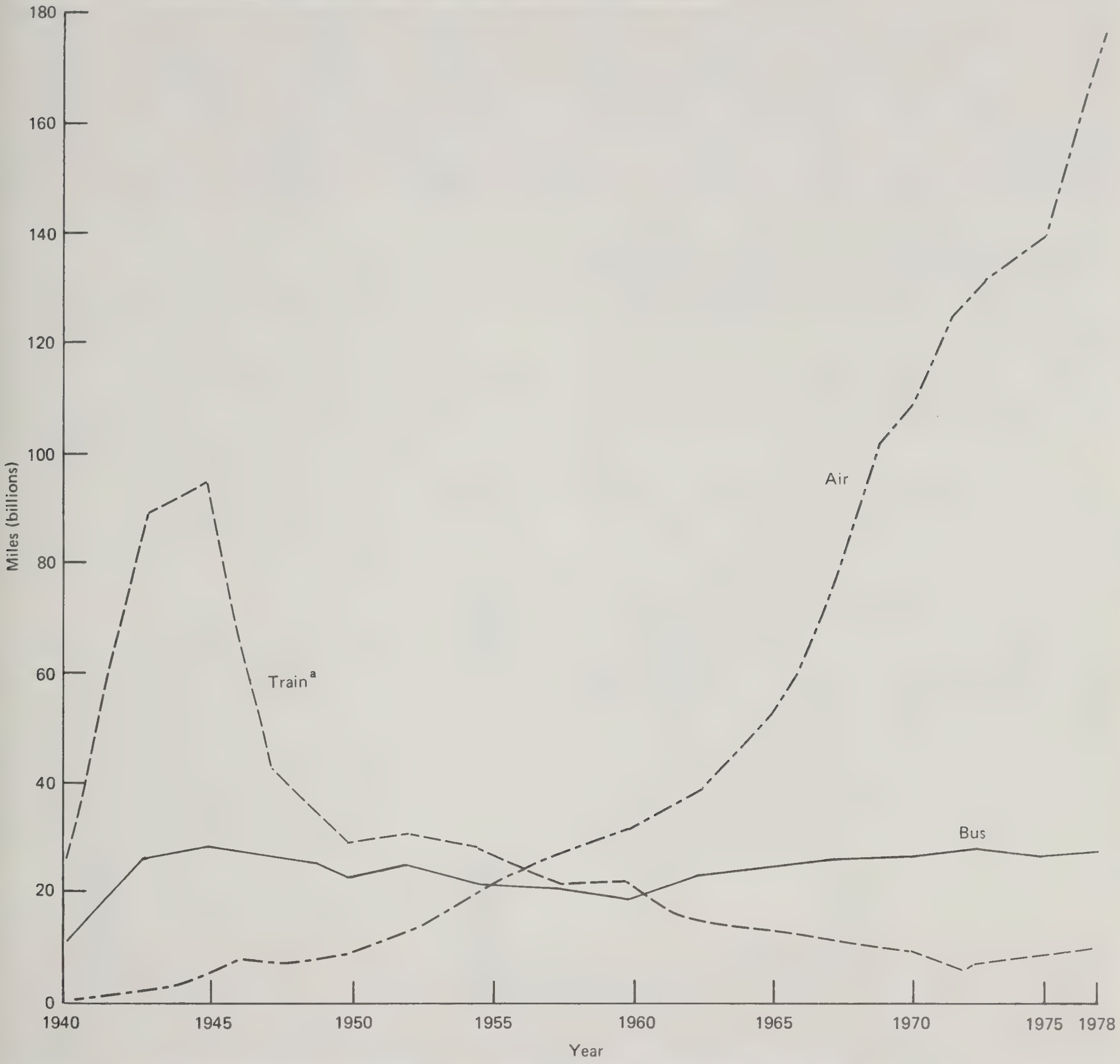
Amtrak has been a major example of a Federal attempt to maintain service in areas not able to justify it economically. Federal Amtrak subsidy has grown rapidly without any sign of tapering off, recently exceeding $500 million per year in providing service to 20,000,000 riders.[112] Local air carriers have likewise been subsidized in the range of $70 to $80 million annually to sustain service to small communities.[113] Subsidy programs for bus have been enacted by the 1978 Surface Transportation Assistance Act, [114] but not yet appropriated. Some states have programs under which subsidies of certain kinds are made available for state support (such as loans for new equipment and support for operating costs related to new services). Expenditures to date under these programs have been relatively small.[115]

Present intercity service offers limited speed and cost options. In short-range markets, there are no substantial high-speed options—air being relatively slow due to excessive access times, and the auto and bus being fixed at a maximum upper speed limit

Present intercity service offers limited speed and cost options. In short-range markets, there are no substantial high-speed options—air being relatively slow due to excessive access times, and the auto and bus being fixed at a maximum upper speed limit of 55 miles per hour. This market is often indicated as having potential for high-speed rail service; however, substantial capital investment is required. Where auto, bus, and air speeds are often impaired by road and airway congestion, rail services may gain market share when rail speeds and service levels begin to compare favorably with the other modes.

Similarly, there could be need for a mode intermediate in speed between the auto or bus and air

FIGURE 2. Intercity passenger-miles by common carrier, 1940 to 1978 (in billions).



SOURCE: Transportation Association of America, *Transportation Facts and Trends,* Washington, D.C.: 1978, p. 18.

[a] Less estimated suburban passengers not on commuter tickets.

transport for longer-distance travel at a moderate price. In some respects, this gap is being filled by a diversity of price-service choices in the air mode, including off-peak discount fares and charters.

With the exception of peak holiday periods, the non-urban intercity system does not suffer now from serious congestion problems. Highway congestion is typically a problem only around major urban areas where conflicts between local and intercity traffic occur. If current growth in traffic continues, however, intercity congestion could become widespread. The relative share of Interstate facilities and arterials operating at congested levels is shown in Figure 3.

Air corridors and airports have gained capacity as a result of larger aircraft and increased load factors, so that air congestion has not been a major

TABLE 1. Intercity public-carrier passenger service, 1976

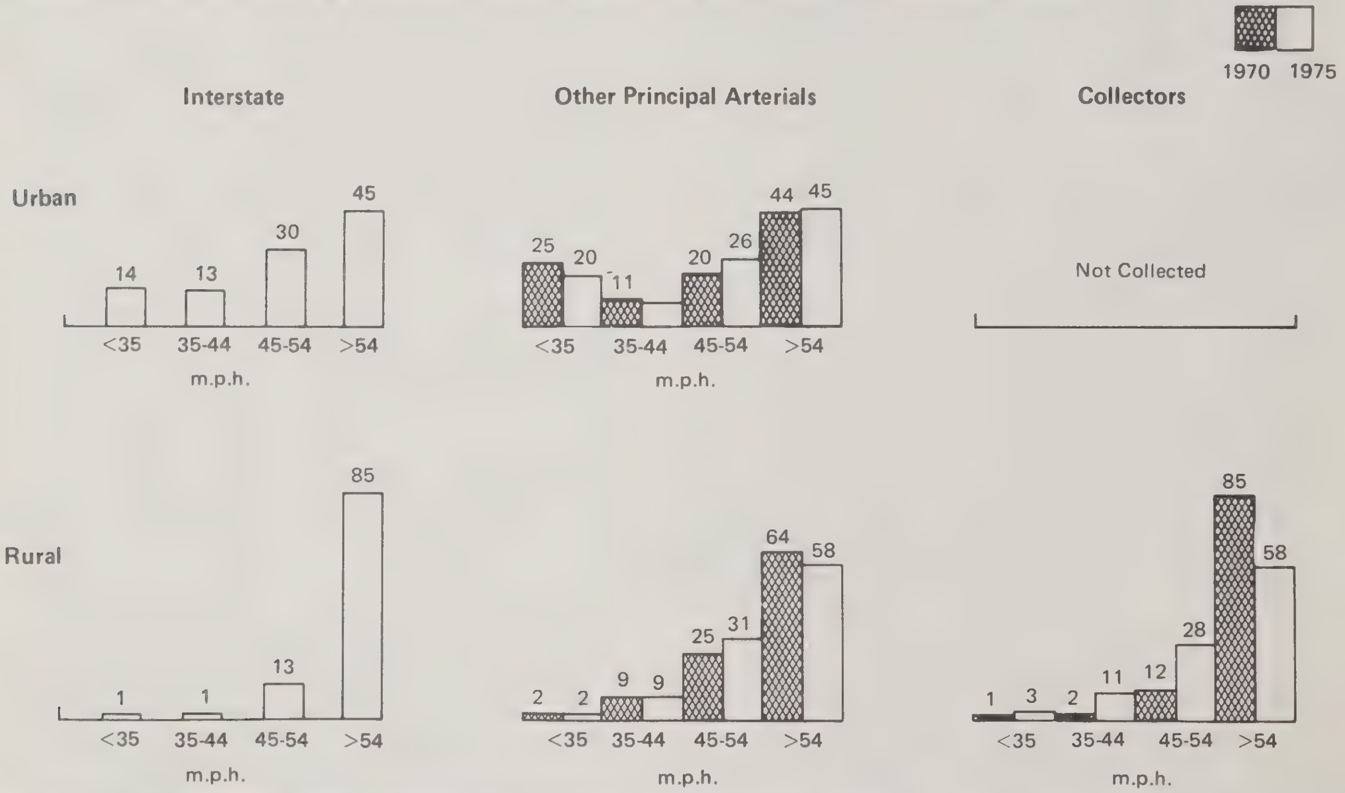
Mode	Number of Vehicles	Route Length (Miles)	Number of Points Served	Average Fare Per Mile (Cents)	Average Speed (mph)	Average Passenger Trip Length
Intercity Bus[a]	20,000	276,000	15,000	[c]5.14	50	110
Intercity Rail[b]	2,000	27,000	432	[c]5.56	46	200
Air Carrier[c]	2,400	322,000	645	8.16	400	700

[a] Interstate Commerce Commission, *The Intercity Bus Industry,* Washington, D.C.: Government Printing Office, May 1978, pp. 21–26.

[b] Association of American Railroads, *Operating and Traffic Statistics, 1976,* Washington, D.C.: June 1977, p. 5.

[c] U.S. Department of Transportation, Transportation Systems Center, *National Transportation Statistics,* Cambridge, Mass.: September 1978, pp. 14–16.

FIGURE 3. Peak-hour operating speeds, by functional highway system, 1970 and 1975 (percent of miles).



SOURCE: U.S. Congress, House, Committee on Public Works and Transportation, *The Status of the Nation's Highways: Conditions and Performance,* Report of the Secretary of Transportation, 95th Cong., 1st sess., Washington, D.C.: Government Printing Office, 1977, p. 96.

concern.[116] As air travel demand grows, hub volumes may be alleviated by fewer connecting operations and direct routings between medium and small hubs.

Intermodal Connections

A remaining weakness in intercity service is poor connection between modes of transportation. The lack of information and other supporting services, such as through-ticketing and baggage handling, that would be characteristic of a true intermodal system are examples of the difficulty. Generally only the automobile provides unified service from origin to destination. There are few intercity bus and rail connections at airports, few good transit services to airports, and little connection between bus and rail. Auto access to bus and rail is also weak, often due to the high-density downtown sites of bus and rail terminals, which make parking difficult and expensive. Some development of suburban terminals is making rail and bus services more accessible to automobiles.[117] Airports, on the other hand, have become increasingly accessible to automobiles over the past ten years.[118] Large facilities for long-term parking are more generally available at airports. Automobile rental systems offer extensive, automated means for intermodal transfers at destination airports.

Safety

Overall, the U.S. intercity system is one of the world's safest, and in terms of accident rates per mile of travel it is continually improving its record. The fatality rate per mile has declined 40 percent in the last decade,[119] yet total accidental deaths remain high due to growth in use of the system rather than to its safety characteristics. U.S. accident and death rates per mile of intercity travel average 3.6 per 100 million miles and are much lower than comparable rates in other countries.[120] The intercity public-carrier modes have accident and death rates far lower than the auto mode.[121]

FREIGHT TRANSPORT—INTERCITY

The Intercity Freight System

The physical size and capacity of the U.S. freight system is prodigious. It provided over 2.3 trillion ton-miles of freight service in 1977[122] and encompasses the vehicles, terminals, rights-of-way, and other facilities engaged in freight movement.

VEHICLES

Highway vehicles constitute the largest component of the freight-vehicle fleet. There were approximately 28 million trucks in the U.S. in 1977, more than twice as many as in 1965.[123] About 1.2 million were owned by Federal, state, and local governments.[124] Approximately 40 percent of the non-government fleet is used by individuals as personal vehicles; the remaining 15 million vehicles include a variety of types and sizes as tabulated in Table 2.[125] Although large tractor-trailer combinations constituted less than 5 percent of the total, they are responsible for the majority of ton-miles of service provided by both for-hire trucking and private industry.[126]

The rail-car fleet consists of approximately 1,700,000 rail cars and 27,700 locomotive and booster units.[127] Approximately 200 of these units are electrically powered.[128] The others (except for 11 remaining steam engines still in service)[129] are diesels.

The car fleet, with a variety of types as shown in Table 3, is owned by the railroads, car companies, and shippers. A decline in the number of cars in service has been offset by a steady increase in average capacity to over 75 tons per car.[130]

The commercially navigable waterways of the U.S. exceed 25,000 miles in length.[131] The water fleet is predominantly located on the Mississippi River system and the Gulf Intracoastal waterway and consists of approximately 4,000 towboats and tugs, plus almost 27,000 non-self-propelled vessels.[132] Towboats average over 100 feet in length and some of the newer towboats extend 200 feet.[133] The number of towboats in the fleet has remained nearly constant over the last 5 years.[134]

TABLE 2. Private and for-hire trucks by type, 1975

	Private[a]		For-Hire		Total	
	Number	Percent	Number	Percent	Number	Percent
Single Unit Trucks						
2-Axles	22,432,496	94.9	378,845	39.4	22,811,341	92.7
3-Axles	596,524	2.5	43,276	4.6	639,800	2.6
Total Single Units	23,029,020	97.4	422,121	44.0	23,451,141	95.3
Combinations						
3-Axles	102,078	0.4	70,181	7.3	172,259	0.7
4-Axles	198,609	0.8	145,899	15.2	344,508	1.4
5 or more axles	318,301	1.4	321,499	33.5	639,800	2.6
Total Combinations	618,988	2.6	537,579	56.0	1,156,567	4.7
Total Trucks	23,648,008	100.0	959,700	100.0	24,607,708	100.0

SOURCE: American Trucking Associations, Inc., *American Trucking Trends, 1975*.

[a] About 3 million of the private trucks are farm trucks.

TABLE 3. Rail car inventory, January 1, 1979

Car Type	Total	Class 1 Railroads	Other Railroads	Car Companies and Shippers
Box cars:				
Plain	262,986	217,307	32,335	13,344
Equipped	172,685	166,719	5,733	233
Covered hoppers	246,087	161,903	3,409	80,775
Flat cars	146,402	97,752	3,799	44,851
Refrigerator cars	87,601	68,059	3,648	15,894
Gondola cars	175,777	158,680	5,240	11,857
Hopper cars	354,086	327,047	11,296	15,743
Tank cars	174,170	2,542	57	171,591
Other Freight cars	32,980	26,491	3,384	3,105
Total	1,652,774	1,226,500	68,881	357,393

SOURCE: American Association of Railroads, Car Service Division.

RIGHTS-OF-WAY

Although nearly all of the 3,800,000 miles of road in the U.S. are available for truck use, some 700,000 statute miles of the total system are most heavily traveled.[135] In 1975 the rail system consisted of somewhat less than 200,000 miles of line, operating between 4,000 rail yards.[136] The miles of line and track in the rail system have been in continuous decline for much of this century.[137] Over 1,400 TOFC (trailer-on-flat-car) terminals exist for direct truck-rail interchange.[138]

A main component of the air freight system consists of 55 airports receiving all-cargo or wide-body lower-hold service.[139] Over 9,000 communities are served by air freight pickup and delivery service.[140]

Activity and Levels of Use

Figure 4 compares the intercity freight modes by tons carried, ton-miles produced, and revenues received. Modal shares have changed significantly over the years. The rail share of ton-miles declined as other sectors, particularly pipeline and truck, gained. Air freight, although insignificant in terms of tons and ton-miles, has a significant share of revenues, providing relatively high-priced service for high-value goods.

Among the crucial commodity characteristics which determine modal choice are value, density, size, and perishability. Important trip characteristics are load size, trip distance, frequency of trips, and scheduling requirements. The modal elements to be matched with these are services, schedules, travel time, and costs. The interplay of shipment and service characteristics produces a pattern of modal shares for each commodity that varies geographically and with time.

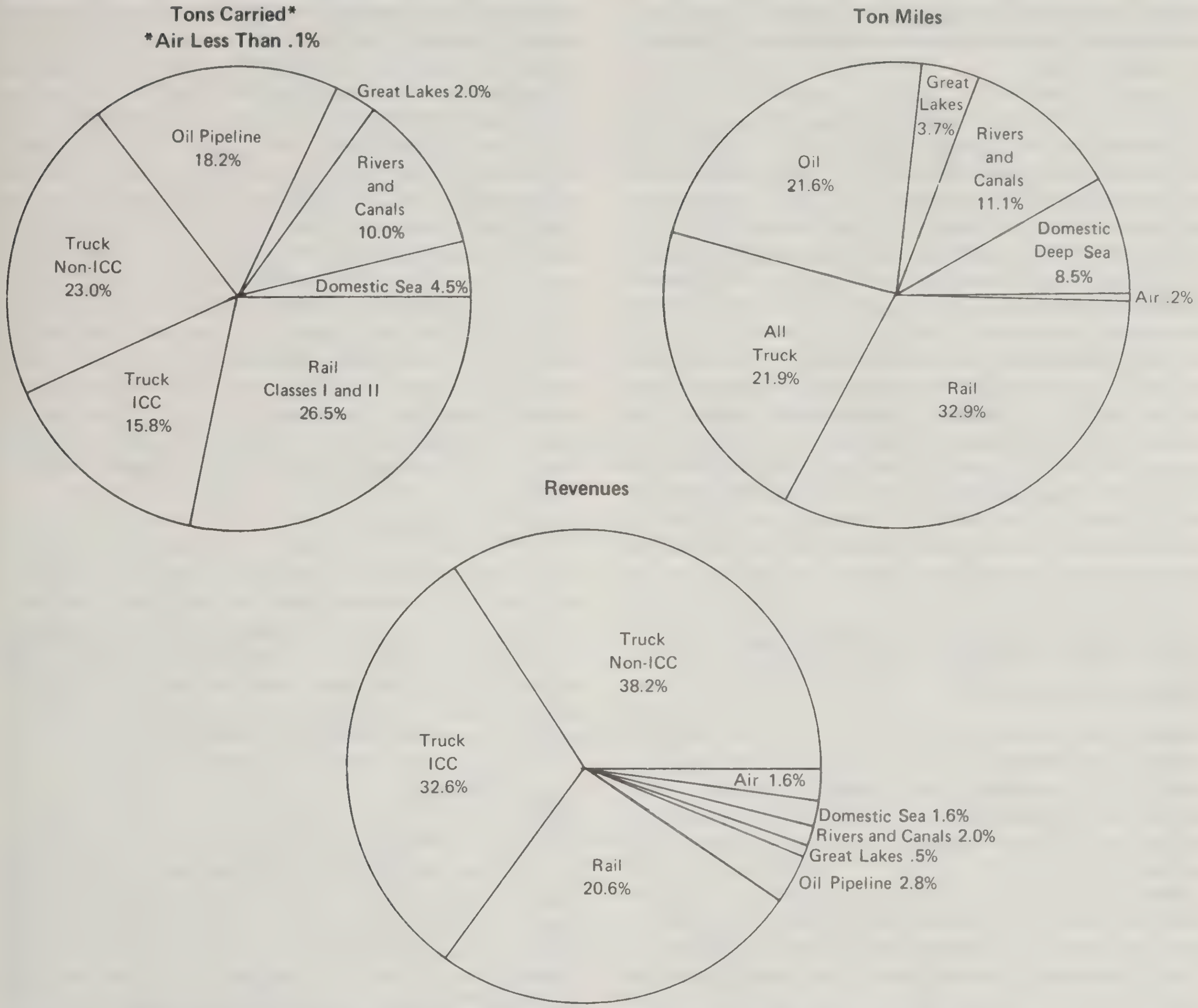
Different segments of the freight industry are associated with different commodities. Consequently, a mode's growth and success can be linked with changing patterns in the growth of the commodities it moves. Appendix Table 5 identifies the ten more important commodities for each mode.

In this period of concern for energy, the importance of energy-producing commodities in overall intercity freight activity should be highlighted. By reference to Appendix Table 5, it can be seen that the movement of energy commodities represents a major, sometimes dominant, activity for each mode, except possibly trucking. If oil and gas pipelines are included (representing almost one quarter of intercity freight ton-miles and carrying energy commodities only),[141] plus international freight tonnages (more than 50 percent of which involve the movement of energy commodities),[142] the full importance to the freight sector of moving energy can be appreciated.

Energy Consumption

The transportation industry itself consumes considerable quantities of energy, particularly petroleum. For this reason any reduction in the transportation of energy would produce a compound savings. Such savings might result from a decrease in tonnage requiring shipment, an increase in the use of renewable resources, or a decrease in the distance tonnage is shipped. Most trends, however, point in the opposite direction. In particular, the average shipping distances of petroleum and coal have increased.[143]

FIGURE 4. Distribution of freight by mode, 1977.



SOURCE: Transportation Association of America, *Transportation Facts and Trends,* Washington, D.C.: 1979, pp. 4, 8, 10.

INSTITUTIONS AND ACTIVITY IN THE INTERNATIONAL MARKET

INSTITUTIONS

A number of international bodies influence transportation. Also, the marine and air transportation industries have set up international organizations jointly to control prices and other economic factors in specific routes or markets.

Ocean freight rates are established and published by steamship conferences. Conferences are organizations of shipping companies which were formed to control freight rates, standardize shipping practices, and provide regularly-scheduled service between designated ports. There are approximately 120 route or market-specific conferences in the ocean trade of the U.S.[144] An investigation of shipping companies begun by Congress in 1912 led to the passage of the Shipping Act of 1916 which established the present pattern of regulation.[145] It exempted certain anti-competitive agreements of steamship conferences from the antitrust laws when such agreements were filed with and approved by a designated government agency. This authority is now vested by Congress in the FMC.

A number of cooperative, international transport organizations facilitate resolution of multi-national issues. For example, the Inter-Governmental Maritime Consultative Organization (IMCO) has addressed the problem of cargo container standards and tanker safety.

United States international air carriers generally receive landing rights in foreign countries as a result of bilateral international agreements which grant reciprocal rights in the U.S. to the other nations' air carriers. A group of contracting nations formed the International Civil Aviation Organization (ICAO) as part of the United Nations. ICAO develops and sets navigation, communication and air traffic control standards for its members and fosters international air navigation planning.

U.S. international air carriers have usually belonged to the International Air Transport Association (IATA). IATA is a voluntary organization open to any scheduled air carrier whose home country is a member of ICAO, and it establishes international rates and fares, subject to unanimous resolutions of the member carriers and veto by the involved countries. In recent years some air carriers have decided not to use IATA's service.

PASSENGER TRAVEL—INTERNATIONAL

Balance of Payments

International passenger travel, both by Americans traveling outside the U.S. and by foreign visitors to the U.S., is an activity with significant ramifications outside of the usual transportation concerns. Chief among these is the effect on the national balance of payments position.

The approximately 20 million foreign visitors each year represent only about 4 percent of intercity travelers in the U.S.[146] They are a valuable source of foreign exchange, ranking fourth in dollar earnings among U.S. export industries.[147] In 1978, receipts from visitors were approximately $8.5 billion, of which $7.3 billion was spent on goods and services in the U.S. and the remainder, $1.2 billion, was paid to U.S. carriers.[148] This $8.5 billion amounted to somewhat more than 4 percent of U.S. export earnings, remaining roughly constant from 1968 to 1978 as both receipts from tourism and total exports grew at an annual average rate of 16 percent over the period, although foreign visitor receipts have grown faster than general exports in recent years.[149]

The U.S. transportation system provides foreign visitors few unique services. Compared with other countries, multilingual, information, and money-changing services in the U.S. are limited. As the number of visitors grows, ancillary services will be in greater demand.

Travel abroad by U.S. citizens has not risen as dramatically as travel to the U.S. by foreign visitors. Travel abroad doubled from 1960 to 1970, but since 1971 has been stable at somewhat more than 22 million travelers yearly.[150] U.S. citizens spent $9.4 billion for travel abroad in 1976, including $7.7 billion on goods and services and $2.5 billion to foreign carriers, equaling less than 5 percent of U.S. imports and leaving a net travel deficit in U.S. international payments of $2.6 billion in 1976.[151] U.S. citizen expenditures abroad rose about 9 percent in 1977 and 7 percent in 1978, reaching $11.1 billion in that year. The net travel deficit rose to $3.1 billion in 1977 but dropped to the $2.6 billion level of 1976 in 1978.

Sixty percent of the travel deficit is due to foreign air carriers earning more from American passengers than U.S. carriers earn from foreign passengers.[152] This represents an imbalance that is increasing in scale. Despite general improvement in the overall U.S. travel deficit, the imbalance caused by payments to foreign flag carriers has not been reduced.

Sources of Visitors

Most foreign visitors to the U.S. come from Canada and Mexico. Appendix Table 6 shows total arrivals in the U.S. from Canada, Mexico, and all overseas countries in numbers of visitors to the U.S. The modal distribution of arrivals evidences the dominance of air travel for overseas visitors, and of the auto for Canadian and Mexican arrivals.

Ports of Entry

Major points of entry of overseas visitors to the U.S. for overland arrivals are more numerous than those open to arrivals by air and water. The top ten ports of entry for land arrivals in 1977 accounted for only 38 percent of all land arrivals.[153] On the other hand, 80 percent of sea arrivals landed at the leading ten seaports.[154] Air, the dominant mode of arrival, is also the most concentrated. Not only do the top ten airports account for 91 percent of arrivals, but the top five account for 77 percent; New York alone had 34 percent of all air arrivals.[155] Recent decisions to add more ports of entry and exit for foreign travel[156] should help disperse this concentration and also provide more direct air service both for U.S. and foreign travelers.

Charter and Reduced Fare Services

International air service data show a growth in charter flights compared to scheduled service and an increasing proportion of passengers traveling on reduced fares. Carriers have cut prices and added seats. In 1977 in the major international market, the North Atlantic, the average number of seats per aircraft reached 274 compared to 140 in 1967.[157] It may be too early to assess the overall economic impact on U.S. and foreign carriers, but first results indicate the new environment in international air travel will benefit both carriers and passengers.

In 1977, charter services carried 17 percent of international air travelers to and from the U.S.[158] Of the 2.5 million who flew on charter aircraft, approximately 1.7 million flew on U.S. charters and the remainder came on charters of foreign-flag carriers.[159] Most charter travelers were U.S. citizens. The distribution of travelers by flag of carrier and citizenship is shown in Appendix Table 7.

On scheduled flights, which account for 83 percent of international air travel to and from the U.S., U.S. citizens use U.S.-flag carriers less than foreign nationals use their own flag carriers; 52 percent of the more than 12 million travelers on scheduled flights were U.S. citizens.[160] They used U.S.-flag aircraft 55 percent of the time, while foreign nationals used foreign-flag carriers 60 percent of the time.[161] Consequently, U.S.-flag carriers served 48 percent of the travel.[162] A summary of market shares for scheduled travel is shown in Appendix Table 8.

FREIGHT TRANSPORT—INTERNATIONAL

Summary of Imports and Exports

Both the tons and value of goods moving in international trade have grown dramatically since World War II. Tonnages of exports more than doubled in the 17-year period from 1960 to 1977, and import tonnages tripled.[163] On a value basis, air-freight movement is quite significant, representing 17 percent of the value of exports shipped and 9 percent of the value of imports.[164]

Of the $120 billion of exports in 1977, electrical and non-electrical machinery and agricultural commodities were major export items.[165] Large exports of transportation equipment were also important, including $3.6 billion in new autos, $2.0 billion in trucks and buses, and over $6.5 billion in parts, accessories and used vehicles.[166] Civilian aircraft exports of almost $6 billion made a significant contribution to the export balance.[167]

Imports, amounting to $147 billion in value in 1977, have as major categories: petroleum and products (in excess of $42 billion); and machinery (over $13 billion).[168] Imports of transport equipment approximated $19 billion, including over $10.6 billion in new autos and over $5 billion in parts.[169]

Inland Distribution of Goods in Foreign Trade

Little information is available on the inland origins and destinations of exports and imports. The most recent survey data, for 1976, traced the inland legs of international goods flows. According to the survey the trucking mode predominated in terms of both value and weight shipped for exports and even more substantially for imports.[170]

International Air Cargo

Air freight has been a more significant component of international than of domestic air operations. In 1977, scheduled air carriers obtained air freight revenues equal to 15 percent of revenues from passenger operations in international air markets, compared to only 7 percent in domestic markets.[171] With growth at annual rates in excess of 13 percent per year in the early seventies, international air freight revenues exceeded $400 million in 1977 for scheduled carriers, with an additional $200 million obtained by international air cargo carriers.[172] Statistics for 1977 indicate air imports of 1.3 billion pounds and $12.5 billion in value.[173] Exports were 1.8 billion pounds with a value of $20 billion.[174] These figures indicate the high-value nature of international air cargo, approximately $9 per pound for imports and $11 for exports.[175] In 1974, U.S. carriers obtained 40 percent of the import market by value, and 34 percent by weight and 15 percent by value of the export market.[176] Appendix Table 9 provides detailed market data for that year for all carriers and U.S. carriers.

Air cargo flows are highly concentrated, for the most part paralleling international air passenger traffic. New York accounts for approximately 50 percent of all cargo activity by weight or value for imports and exports.[177] Other major ports in descending order of cargo value handled are Los Angeles, Chicago, San Francisco, and Miami.[178] These four ports, with New York, account for more than 80 percent of import and export air cargo activity.[179]

International Waterborne Cargo

Most foreign trade tonnage moves by water. In 1977 international waterborne commerce reached 915 million tons.[180] Of these, 635 million tons were imports and 280 million tons were exports.[181] On a tonnage basis, the major commodities moving in foreign waterborne commerce in 1975 are shown in Table 4. The petroleum and iron categories were primarily imports; the coal, grains, and logs were primarily exports; the other categories were relatively balanced. According to 1976 data of the U.S. Bureau of Census, the shares of this commerce obtained by U.S.-flag carriers were 4.7 percent of imports and 6.0 percent of exports, or 5.2 percent overall.[182]

The privately owned portion of the U.S.-flag fleet ranked tenth in the world in size in 1977 with 2.4 percent of the 23,902 ships over 1,000 gross tons in size.[183] The scale of the U.S. fleet in the major ship categories is shown in Table 5. In 1966 the U.S. ranked fifth on a tonnage basis.[184] The size of the merchant fleet declined until 1970, but has climbed slowly since.[185]

The world rankings of national fleets indicate the considerable use of flags of convenience in countries such as Liberia, and the continuing growth of the Soviet fleet, particularly in small merchant ships. The Soviet merchant fleet, ranked twentieth 20 years ago, is second today in number of ships and eighth in deadweight tonnage.[186]

Ports

There are approximately 170 major commercial ports in the U.S.[187] Since the Second World War, the share of foreign compared to domestic traffic handled by these ports has increased significantly. In 1947, coastal port domestic traffic was almost three times the tonnage of foreign traffic.[188] By 1975, foreign traffic had become almost 80 percent of the volume of the domestic traffic.[189]

TABLE 4. Major commodities in waterborne foreign trade, 1975

Commodities	Tons (Percent)
Petroleum & Products	44.7
Coal & Coke	10.5
Iron Ore, Iron and Steel	9.8
Sand, Gravel & Stone	1.8
Grains	10.6
Logs and Lumber	3.2
Chemicals	5.0
All Other Commodities	14.4
Total	100.0

SOURCE: U.S. Corps of Engineers, *Waterborne Commerce of the U.S.*, Vicksburg, Mississippi: 1975, p. 3.

The Maritime Administration estimates that within U.S. ports there are now 2,400 marine terminal facilities capable of handling foreign commerce.[190] These facilities are owned by a mixture of private and local public agencies providing a range of services to the shipping industry. They make a net contribution in foreign exchange to the U.S. balance of payments through receipts from foreign vessel expenditures[191] and serve as the vehicle for collection of almost $6.3 billion in customs income.[192]

Trends in ship construction and operation, such as container ships, barge ships, and very large tankers, have created demands on ports for highly specialized facilities, designed to handle unitized cargoes rapidly with minimum delay. The result has been increased capital requirements and reduced operating times and costs.

Assistance to public ports has come from state and local governments. No Federal programs finance the development of port facilities; however, the Maritime Administration does provide design and planning assistance, and both the Corps of Engineers and Coast Guard provide services in channel development and sea-lane operation.

SUMMARY

Transportation supports the nation's social and economic activities, and in turn, transportation stimulates these activities. Many private and public institutions or groups are involved with transportation. The private sector, which has the primary operating role, is segmented and complex.

An array of government institutions is directly involved in transportation. Federal programs have

TABLE 5. U.S. waterborne fleet, 1975.

Ship Type	Number of U.S. Ships	U.S. Deadweight Tons (thousands)	U.S. Rank in World Tonnage	First Ranked	DWT of First Ranked (thousand)
Freighter	299	4,931	7	Liberia	10,967
Gen. Cargo	113	11,518	—	USSR	9,840
Containership	105	1,734	1	U.S.A.	1,734
Part. Cont.	45	665	2	USSR	706
Roll-on/Roll-off	13	205	1	U.S.A.	205
Barge Carriers	23	809	1	U.S.A.	809
Bulk Carriers	18	529	—	Liberia	40,464
Tankers	269	10,714	8	Liberia	101,232
Passenger Ships	6	50	—	USSR	250

SOURCE: U.S. Department of Commerce, *Merchant Fleets of the World*; Washington, D.C.: Government Printing Office, 1976, pp. 34–43.

influenced the nature of state and local institutions and numerous Federal bodies have evolved to administer regulatory and promotional programs initiated by the Congress. State and local governments develop, plan, own, operate, maintain, or regulate various facets of transportation. The pattern varies from one state or jurisdiction to another, determined by local conditions. Lines of authority, responsibility and accountability between various levels of government have become blurred and overlaps exist. The current division of responsibility as it affects transportation will be discussed in more detail in later chapters.

Chapter 1 has highlighted the institutions involved in transportation, pointing out the interactions of governments with private-sector providers and users of transport services. Trends in transport activity have been described, by market and by function of passenger or freight movement. The dominant role of the auto has been documented, although in intercity passenger transport, air carriage has come to provide more than one in ten passenger-miles traveled. Intercity freight transport, at a relatively stable tonnage level for the decade of the 1970s, has come to be dominated by motor carriage in terms of revenues received, yet the railroads still produce the most ton-miles of service of any mode. The international market has been shown to be growing in terms of both passengers and freight as part of total U.S. transportation activity.

The next chapter describes the present extensive policies and programs of the Federal government that affect both passenger and freight movements in all the transportation markets of the U.S. Chapter 3 presents similar information for state and local governments.

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    Atlanta
    Tampa
    New Orleans
    Houston
    Dallas/Ft. Worth
    St. Louis
    Kansas City
    Denver
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Federal Transportation Policies and Programs

2

INTRODUCTION

This chapter describes the transportation policies and programs of the Federal government. As no full compilation of Federal policies and programs existed, one research task of the NTPSC was to inventory transportation policies and programs as enunciated by the Congress, Federal agencies (legislative, executive, and independent), and the judiciary.[1] All major transportation policies and programs have been identified, including those that affect the supply of transportation services and those which have a direct or indirect effect on the demand for transportation.

A primary purpose of this chapter, in addition to enumerating Federal transportation policies and programs, is to point out potential problems, or issues, that may arise from gaps and conflicts in these policies and programs. "Gap" is defined as "a void or inconsistency" in Federal actions; a "conflict" poses "competing directions" for the Federal transport role. (These and other definitions are explained further in Appendix I, Policy Definitions.) In short, these are symptoms that may require policy remedies.

RESEARCH APPROACH

In gathering policies and programs, as reported fully in NTPSC Special Report No. 6, *A Compendium of Federal Transportation Policies and Programs,* it became evident that compiling programs is much easier than discovering policies. This is because program summaries are more readily available than policy statements. The *Catalogue of Domestic Federal Assistance* (by the Office of Management and Budget—OMB), reports to Congress by Federal agencies, and studies by the General Accounting Office (GAO), are good sources of program information.

Policies, on the other hand, are much more elusive. People define policies in different ways, and the NTPSC found that many government employees are not concerned with policy, at least not in the sense of specifically stating which policies have been adopted to guide their decisions. The NTPSC defines policy as a guide for choice—a method for choosing between competing ways to pursue goals. This definition was used when researchers attempted to glean from the written and spoken words of Federal officials and employees an inventory of the guidelines (the status quo policies) they use in making decisions in transportation. These policies, along with more easily identified programs, provide a base from which changes can be proposed to improve transportation in the U.S. It should be noted that each policy (guide for choice) is not always associated with one or more programs that seek to implement the policy. The world of Federal transport policy is not organized in such a neat fashion. The proliferation of policies and programs is especially troublesome when seeking to measure the exact levels of Federal expenditures on transportation and transportation-related programs.

A 1975 GAO staff report stated that Federal spending for transportation in 1974 totaled about \$11.3 billion.[2] The combined transportation account in the Federal Budget for Fiscal Year 1979 shows that actual outlays for transportation in 1977 were slightly under \$15 billion, and anticipated FY 1979 outlays are predicted to be less than \$18 billion.[3]

Neither the budget nor the GAO calculations include the litany of social service programs (as implemented by Action, Community Services Administration and HEW). These programs supply transportation for their clients, or provide funds with which clients may purchase transportation services in the marketplace, and serve to raise considerably the total Federal expenditure for transportation. The GAO report relied upon a survey of 32 Federal agencies and 12 major congressional committees. The NTPSC has identified 64 Federal agencies and 30 congressional committees as having jurisdictions which affect the supply of and demand for transportation services.

INSTITUTIONAL SOURCES OF U.S. TRANSPORTATION POLICIES AND PROGRAMS

Policies are determined and programs shaped at various levels of the Federal government by numerous actions. Both formal and informal channels are part of policy and program formulation. Too, elucidation of policies and administration of programs may differ from published details, often due to the force of an individual personality, such as that of a congressional committee chairperson. Thus, the institutional details discussed below may vary in individual cases.

CONGRESSIONAL COMMITTEES

A description of the jurisdiction of congressional committees provides a convenient means for discussing the role of the Congress in transportation decisionmaking. It is primarily through its committees that Congress expresses policy, establishes programs, and sets funding authorization and appropriation levels for transportation. Statutory language is the most formal means by which Congress participates in decisionmaking at the Federal level. Less formally, Congress provides guidance on policies and programs to the executive branch, the regulatory agencies, and the judiciary through committee reports and hearing records. Such congressional guidance may, at times, serve as de facto legislation. In addition, individual members of Congress may display interest in transportation policy through correspondence and personal contact with agency heads and program managers.

Congress' committee structure has made coordination of policy through legislation difficult. Programs are often legislated according to mode, rather than by function, reflecting the jurisdiction of the then-existing congressional committee structure. An example is provided by the Surface Transportation Assistance Act of 1978, which adopted new policies for the highway and transit modes. This legislation was considered by the Public Works and Transportation Committee and the Ways and Means Committee in the House of Representatives. In the Senate, the bill was considered by the Commerce, Science and Transportation Committee, the Environment and Public Works Committee, the Banking, Housing and Urban Affairs Committee and the Finance Committee. In reconciling differences between the House and Senate versions of this legislation, there were five sets of Senate conferees appointed to meet with a single group of House conferees.[4]

Virtually every congressional committee in some way influences either transport demand or supply. Appendix A of NTPSC Special Report No. 6 describes briefly the legislative and oversight responsibilities of those 30 congressional committees that are involved directly in transportation decisionmaking.

FEDERAL AGENCIES (LEGISLATIVE, EXECUTIVE, AND INDEPENDENT)

Federal agencies are responsible for carrying out policies and programs mandated by Congress, but at times themselves make policy and alter program details. Because each agency must function within limits established by Congress, while at the same time satisfying constituents and employees, gaps or conflicts in Federal transportation policies and programs arise. Sometimes Congress requires an agency to meet a goal, without providing the means to do so. In such cases, the ways in which an agency chooses to allocate its budget and personnel may shape policy. In other cases, agencies may implicitly thwart the will of Congress, as certain segments of the bureaucracy may be insulated from congressional oversight and be longer-lived than particular concerned members of Congress (who may fail to be reelected).

Appendix B of NTPSC Special Report No. 6 summarizes the transport-related responsibilities of 64 Federal agencies identified as having some involvement in transportation policy development and program implementation. Legislative agencies (e.g., Congressional Budget Office—CBO), executive agencies (e.g., Department of Transportation—DOT), and independent agencies (e.g., Interstate Commerce Commission—ICC) are all included in Appendix B, which also provides an example of a policy or program that demonstrates the agency's relationship to transportation.

Department of Transportation

The U.S. Department of Transportation is the largest of the Federal transport agencies and administers a major portion (amounting to over $10 billion annually) of the Federal government's transportation expenditures. Established April 1, 1967, DOT is headed by an Office of the Secretary; five Assistant Secretaries have functional responsibilities that cut across all modes of transportation. Each of eight "operating administrations," except for the Research and Special Programs Administration, administers programs associated with a single mode or aspect of transportation. The current organization of DOT is shown in Appendix Figure 1. (However, DOT has proposed to combine the Urban Mass Transportation and the Federal Highway Administrations—UMTA and FHWA—into a unified administration.)

The U.S. Coast Guard, the Federal Aviation Administration (FAA), FHWA, the Federal Railroad Administration (FRA), the National Highway Traffic Safety Administration, and UMTA each has a regional staff. Several also have sub-regional field offices and facilities. DOT has aligned the regional boundaries of its Administrations with the ten Federal Regions and colocated offices whenever practical. In some cases the functions of Administrations made the same boundaries and locations impractical; for example, most Coast Guard activity is along the coasts, while rail activity is largely inland.

Regulatory Agencies

The Interstate Commerce Commission (ICC), the Civil Aeronautics Board (CAB), and the Federal Maritime Commission (FMC) have responsibility for regulating land, air, and maritime modes, respectively. The ICC regulates, in varying degrees by mode of transport, surface carrier operations; it conducts investigations and awards damages where applicable, and administers railroad bankruptcy. Although recent legislation is phasing out economic regulation of air carriers, the CAB currently regulates air carrier operations; it determines and grants subsidies. The FMC regulates services, practices, and agreements of common carriers in international trade. In addition, the Federal Energy Regulatory Commission (FERC), the Department of Justice's anti-trust division, and the Federal Communication Commission (FCC) regulate aspects of transportation and communications.

THE JUDICIARY

Just as Congress and the Federal agencies interact to determine transport policies and programs, so too does the judicial system. The courts may be called upon to interpret statutes or reconcile conflicts. Persons interested in altering existing policy may find the means to do so more readily through the courts than they might through other channels. At times, other branches or levels of government may defer to the judicial system, perhaps to avoid making unpopular decisions.

In some cases, Federal agencies (such as the regulatory commissions) make policy or administer programs using quasi-judicial processes. In these cases, requirements for due process may conflict with desires for speedy resolution of the issues.

Conventional wisdom holds that the role of the courts in the area of policy is to interpret the meaning of policy as enunciated in statutes, regulations, executive orders and treaties. But Americans also look to the courts for resolution of difficult social problems. At any given time, transportation policies are being adjudicated at different levels of the judicial system or are being remanded to agencies for alteration. Some recent decisions indicate the growing importance of the courts concerning transport policy in the U.S.

In 1978 the U.S. Supreme Court, in a five to three decision in *Federal Maritime Commission* v. *Pacific Maritime Association,*[5] held that a collective bargaining agreement between a maritime employers' association and a maritime labor group must, under the Federal Shipping Act, be submitted for approval to the Federal Maritime Commission (FMC) if the agreement has anti-competitive impacts. (Previously, it had been thought that the Shipping Act did not give the FMC jurisdiction over unions or union agreements.) This decision could create problems in the maritime industry if an "eleventh-hour" labor-management agreement is required to be submitted to the FMC, as unions are likely to stop working under their "no contract, no work" tradition.

In *Atchinson, Topeka and Santa Fe Railway Company, et al.* v. *Howard H. Calloway, et al.,*[6] a U.S. District Court held that Locks and Dam 26 on the Mississippi River could be replaced only by specific authorization from Congress. Previously, the U.S. Army Corps of Engineers had routinely rebuilt water resource projects which had become structurally deficient or functionally obsolete. This decision will probably result in the Corps' not proceeding with any *rebuilding* project without first obtaining specific congressional authorization.

U.S. Supreme Court rulings have also recently altered state tax policies affecting transportation products and services. In 1977, the Court ruled that Mississippi could levy a gross receipts tax on a Michigan corporation moving motor vehicles by truck from railheads in Mississippi to dealers within the state.[7] This policy greatly enlarges the potential for states to have an impact, adverse or positive, on interstate commerce.

In 1976, the Court upheld a state property tax on imported tires.[8] Previous interpretations of the Constitution had banned all such state levies. The Court now holds that these taxes are permissible if they do not interfere with foreign policy, reduce Federal revenue, or cause conflict among the states. As a result of this new policy, states have more power to "control" their imports. This example shows that the transport sector is affected by decisions that relate to interstate commerce in general. It also illustrates the dependence of the transport sector on judicial rulings that serve to alter, directly or indirectly, transportation demand or supply (as in this case, in which tires are an input to the production of transport services).

Finally, in October 1978, by refusing to review an Appeals Court ruling on Federal Motor Vehicle Safety Standard 121 (covering requirements for maximum braking distances and the use of computerized antilock devices on trucks and buses), the Supreme Court accepted the appellate ruling, which denied enforceability of the standard in its existing form, largely because the standard was neither reasonable nor practical at the time it was put into effect.[9]

FEDERAL TRANSPORTATION POLICIES AND PROGRAMS

THE INTERCITY MARKET

This section addresses Federal transport policies affecting the intercity transportation of passengers and freight and the programs developed to implement these policies.[10]

The intercity market incorporates transportation between U.S. urban places of at least 2,500 population, as well as interstate transportation generally. In particular cases, relatively high-density movements between Standard Metropolitan Statistical Areas distinguish intercity policies and programs from those of the rural market characterized by lower-density movements between smaller places. In other words, the definitions of markets are meant to be very broad and need not be mutually exclusive.

Many Federal transportation policies and programs directly affect both intercity and rural markets. Such policies and programs generally are discussed in the intercity market section. For example, the basic aspects of ICC regulation of motor carriers are discussed in the intercity section, while the ICC's agricultural co-op exemption is given primary consideration in the rural section. Whether a particular policy or program should be considered within one market or another depends on the context of the problem. (Chapters 1 and 9 both provide data on relative magnitudes of transport demand and supply among markets.)

Regulation

The Federal government regulates many aspects of transportation activity. On the one hand, entry and exit, routes and other certificate restrictions, rates, and quality of service are often regulated by the independent regulatory commissions and other agencies. This is known as "economic" regulation. On the other hand, many other aspects of transportation are regulated, including energy use, environmental impact, and safety. This regulation is labeled here simply as "other."

Common themes discussed below attributed to both types of regulation include the lack of uniform criteria (policies) to guide the determination of regulations, and the static, unchanging nature of the regulations. Certainly regulatory policies differ among transport modes and markets. The lack of sunset review or some other dynamic mechanism is apparent. Another theme is the frequent disparity between *stated* regulations and regulations as they are *actually* enforced. The lack of uniform, vigorous enforcement of regulations often contributes to abuses that may be blamed on the regulations themselves.

ECONOMIC REGULATION: ENTRY

The Federal government is extensively involved in regulating the entry of transportation carriers into the intercity market. The CAB still awards certificates to air carriers for passenger service between city-pairs for the "public convenience and necessity" if the carrier is determined to be "fit, willing, and able."[11] Congress acted in 1978 to shift the burden of proof to those claiming that an air carrier's application is inconsistent with public convenience and necessity. The ICC is more restrictive in its control of the entry of many new carriers, as well as in granting entry into new markets by certain existing carriers, providing certificates of "public convenience and necessity" to common carriers and permits to contract carriers found "fit, willing, and able" to provide the service. All rail carriers and domestic freight forwarders are regulated by the ICC in this regard, as are some parts of the for-hire motor and inland water carrier industry.[12] Natural gas pipelines are similarly regulated by the FERC of the Department of Energy (DOE), while oil pipelines are not so regulated.[13]

Whether regulatory control over market entry should exist is but one policy issue. If it is determined that regulation is appropriate, the question arises whether particular modes, areas, commodities, or groups should be exempt from such control, and what tests should be used for exemption. For example, in legislation enacted in late 1977, *existing* U.S. certificated all-cargo air carriers (and passenger air carriers with all-cargo service) were allowed to provide air cargo service to all U.S. cities at all times. *New* carriers (those not certificated in November 1977) were not permitted the same freedom until November 1978. All carriers now may enter the market freely, subject only to a finding that such carriers are "fit, willing, and able" to serve. Congress also acted in October 1978, to ease, in a gradual manner, entry into air *passenger* markets.[14] The lack of detailed entry control in the air cargo industry and the more restricted but rapidly easing entry controls into air passenger markets raise questions as to whether differences between the movement of goods and the movement of people by air in the intercity market are so great that the one function should remain more regulated than the other, even though the differences are less pronounced as a result of legislation enacted in the 95th Congress.

Within the regulated intercity modes, there exist numerous exemptions, some of which have been a continuing source of controversy. Agricultural cooperatives and the motor-carrier transport of agricultural commodities are exempt from most ICC regulation.[15] ICC regulations provide very detailed definitions of exactly which cooperatives and commodities are exempt. Too, transportation incidental to air movement is not regulated by the ICC.[16] Water carriers are exempt so long as they carry commodities in bulk—and most movements are bulk.[17]

Railroads must seek ICC authorization to construct and operate new lines and to acquire and operate existing lines.[18] However, no permission is needed for jointly-owned-or-used spur tracks. As a result of this exception, major rail construction is proceeding without ICC approval in the western U.S. to serve coal movements, as railroads arrange with shippers to build lengthy lines for eventual purchase by the railroads. Such avoidance of ICC regulation is supported by court rulings.[19]

Regulation generally covers "for-hire" carriers—common and contract carriers.[20] It does not cover private carriers that transport their own goods;[21] however, railroads are not allowed to carry their own produce.[22] The ICC, until November 1978, limited to eight the number of shippers a contract carrier could serve,[23] but has removed such restrictions. In addition, contract carriers by water are exempt from regulation.

ECONOMIC REGULATION: CERTIFICATE RESTRICTION

The ICC also limits carrier entry by attaching restrictions to certificates granted to motor carriers.[24] Such restrictions include commodity, intermediate-point, route, highway, territory, and one-way haul restrictions. With regard to intermediate-point restrictions, the ICC in 1974 adopted rules (since expired) allowing carriers to stop using gateways if the most direct highway distance was not more than 20 percent shorter than the gateway distance between two points.[25] Thus, to save fuel, the ICC permitted easing its gateway restriction, but only if the reduced distance (and consequent fuel savings) was not so great as to risk bestowing a competitive advantage. The Department of Justice (DOJ) met the ICC head-on concerning this policy, with the DOJ urging expansion of this rule by circuity reductions of 16 percent per year for 5 years until circuity would be eliminated altogether.[26]

ECONOMIC REGULATION: EXIT

The Federal government regulates the exit of air, rail and natural gas pipeline carriers in the intercity market. Motor carriers, water carriers and oil pipelines are not similarly constrained.

Certificated air passenger carriers (consisting basically of trunk and local-service carriers) must obtain CAB approval to withdraw from a route. The domestic trunk carriers, however, have found it easy in many cases to leave an established route, because the CAB has readily allowed the trunks to turn over their lower-density routes to local-service carriers which are eligible for Federal subsidies. Similarly, local-service carriers have successfully negotiated the transfer of their service in some areas to commuter airlines that use smaller aircraft, although many communities prefer service by trunk or local-service carriers. In 1978, Congress altered its local-service subsidy (which is now due to expire in 1986) and established a new, 10-year subsidy program for smaller cities that might otherwise lose essential scheduled air service. The new subsidy may favor the United States Postal Service, which has been actively seeking to maintain air service to as many communities as possible in order to meet postal needs.[27]

A rail carrier wishing to abandon a line must first receive ICC approval.[28] ICC authority in this regard applies to passenger as well as freight service. However, in 1975 the Congress adopted legislation which exempts the National Railroad Passenger Corporation (Amtrak) from ICC oversight of service discontinuance.[29]

Natural gas pipeline carriers must obtain abandonment approval from the FERC. Approval is granted if the natural gas company successfully meets the burden of showing that the public interest will not be affected and that the gas will be diverted to a higher-priority use.[30]

It should also be noted that while motor and water carriers can abandon unprofitable routes, without ICC approval, by ceasing to serve them, they may be indirectly deterred by that Commission's power to revoke operating rights on all routes, including the profitable ones. The effectiveness of such a deterrent is a matter of debate.

ECONOMIC REGULATION: RATES

The regulation of rates and fares is generally justified on the grounds of insuring the existence of rates and fares which are just and reasonable, compensatory, and neither unduly discriminatory nor preferential. Throughout the remainder of this subsection, "rate regulation" will be used in a generic sense to encompass freight rates and passenger fares.

The ICC has authority to reject proposed rate changes and to set maximum, minimum and specific rates for regulated motor, rail and water carriers, and domestic freight forwarders. Changes in rates are filed with the ICC in the form of tariffs at least 30 days before they are scheduled to go into effect. The ICC then may determine on its own initiative or on the basis of a complaint (usually through its Suspension Board) whether the rate should be filed, rejected, or suspended based upon whether it is reasonable and lawful. The Suspension Board may allow a protested rate to take effect, may investigate a protested rate, or may suspend and investigate such a rate. A carrier may appeal an adverse Board decision to a Commission Division (but such appeals are seldom effective).

Rate regulation policy is certainly not without gaps and conflicts. While the ICC seeks just, reasonable, and non-discriminatory rates for motor *common carriers,* it seeks just and reasonable *minimum* rates for motor *contract carriers.*[31] Government shippers are conspicuously singled out under Section 22 and similar sections of the Interstate Commerce Act as being free to negotiate rates with ICC-regulated carriers without being subject to provisions of the Act, and even to determine discount rates after shipment.[32] The only requirement is that the rates be filed. Critics of this special policy allege that the government can indirectly use its powers to coerce lower rates from carriers. The Department of Defense is the most frequent user and strongest supporter of Section 22 rates.

Many rate proposals filed by ICC-regulated carriers are developed through broad-based groups of modal carriers known as rate bureaus.[33] The practice of allowing such group ratemaking has been criticized as conflicting with the national policy of prohibiting collusive activities in restraint of trade.[34] On the other hand, some contend that rate bureau operations are necessary for the orderly provision of joint and through rates.[35] In an options paper submitted to OMB, the DOJ proposed eliminating rate bureau antitrust immunity and ending ICC approval of maximum rates.[36] If rate bureaus are allowed to continue, Justice proposes that rates of the large intercity bus carriers (Greyhound and Continental Trailways) be considered separately from the smaller carriers.[37]

Other gaps and conflicts in rate regulation policy have special application to the rail mode. For example, Amtrak is exempt from ICC regulation of rates even though other rail carriers, including the remaining private rail-passenger carriers, are subject to such regulation.[38] Rail carriers are required to assess incentive per diem charges (charges railroads make against other railroads for use of rail cars on a daily basis) on top of flat per diem rates as an incentive for the quick return and acquisition of boxcars. Only certain general-purpose cars are singled out for this special treatment, even though serious shortages of gondola cars have been alleged in recent years.[39] The railroads are also allowed to negotiate unit-train rates for the transport of coal to utilities.[40] Critics argue that such rates are discriminatory or arranged to prevent more efficient modes from winning customers. The railroads insist that only the cost savings from guaranteed, long-term contracts are reflected in these rates. The ICC recently opened up contract ratemaking to railroads, but with restrictions on publication of contract terms.[41]

Another dispute in the regulation of rail rates relates to the ICC practice of preventing many rail rate reductions, even when such reductions would retain rates above variable cost. Section 202(f) of the Railroad Revitalization and Regulatory Reform Act (4R Act) provides that nothing in that Act is to be construed as modifying other laws that give the ICC authority to prevent "unfair, destructive, or predatory prices."[42] The Senate and House reports on the 4R Act, however, define "predatory" to be prices below variable costs.[43] By so defining "predatory," it appears that Congress intended to limit the ICC's discretion in disapproving rate reductions.

Air freight rates for all-cargo carriers and all-cargo operations of CAB-certificated carriers are now virtually free of rate regulation. The CAB acted to eliminate its requirements that carriers publish these tariffs in advance. Many shippers have objected to the CAB change.[44]

The CAB does, however, regulate passenger air fares.[45] On a quarterly basis, the carriers submit cost figures which the Board uses to determine the carriers' indirect costs, revenues, and profits. A comparison of these figures with the Board's determination of the industry's revenue requirements makes it apparent whether a carrier might be permitted a fare increase. After a comparison has been made the carrier may file a new tariff. While protests can be filed at this stage, the fact that a need for change has been determined on the basis of CAB-required procedures leaves little room for argument. Only in 1978 did Congress act to give air passenger carriers limited, automatic rate flexibility. Air passenger rate regulation by the CAB is scheduled to end as of January 1, 1983.[46]

Subsidized air carriers have enjoyed maximum freedom to experiment with rate changes within a range of 100 to 130 percent of the applicable trunk-coach formula.[47] In contrast to this policy of rate flexibility with a cost constraint for subsidized air carriers (presumably for the purpose of subsidy reduction), subsidized transit operators in the urban market are encouraged to keep fares as low as possible through operating subsidies that vary directly with operating losses.

The FERC regulates oil and natural gas pipeline rates by valuing pipeline property and then permitting the pipeline company to charge rates which yield a reasonable percentage of the value as an annual return. However, in evaluating natural gas pipeline property, FERC employs a base of original cost less depreciation, while in evaluating oil pipeline property, FERC employs a factor which measures the cost of reproducing assets at current prices.[48] The DOJ maintains that this reproduction cost method of valuing oil pipelines builds inflation into rates and boosts transportation costs.

OTHER REGULATION

Another type of regulatory policy, in addition to economic regulation, is the establishment of constraints (e.g., no highway projects can be approved for states that allow speeds in excess of 55 m.p.h.) and standards (e.g., highway construction standards developed by the American Association of State Highway and Transportation Officials (AASHTO) and promulgated by the Federal Highway Administration) to help achieve other goals such as safety. At times, conflicts may develop between Federal agencies over these standards and constraints, or two agencies may issue differing regulations concerning the same matter. Enforcement of safety regulations is often cited as an area of Federal involvement that needs improvement.

The National Park Service of the Department of Interior establishes design and construction standards for national parkways on Federal land, while the FHWA administers congressional design standards for the Interstate Highway System and approves standards adopted by AASHTO for other Federal-aid highways. Parkway and highway standards may differ even though some parkways carry as much or more intercity automobile traffic as some Interstate segments (although parkways often exclude heavy trucks).

FHWA's Bureau of Motor Carrier Safety (BMCS) sets standards for such matters as the qualifications of truck and bus drivers, and maximum hours of driver service.[49] The DOE, however, has encouraged the BMCS, at least in times of moderate fuel shortage, to suspend the regulations which limit the number of hours which a truck driver may operate a vehicle during a 24-hour period.[50] This DOE position may conflict with safety goals.

Finance, Pricing and Taxation

This section lists some inconsistencies in providing Federal assistance to intercity transportation. The uneven treatment of competing transport modes that results from these inconsistencies shows the need for development of overall national transport policies.

Federal assistance to intercity transportation consists of financial aid to state and local governments, as well as to private carriers. However, there is variance in the Federal shares for different intercity transportation programs (e.g., 100 percent Federal payment for pavement-marking projects versus 75 percent sharing for Federal-aid primary highway construction projects), and in levels of Federal involvement in different modes (e.g., virtual Federal ownership of intercity rail passenger transportation since 1970 as compared to no direct Federal assistance to intercity bus transportation until aid was authorized in 1978).

Amtrak subsidies are provided to cover operating deficits and capital improvements in order to maintain some intercity rail passenger service.[51] State and local agencies may also request Amtrak to provide new service with the state or local entity paying 50 percent of the subsidy requirement.[52]

Subsidies go to local-service air carriers to support "necessary" intercity air passenger service to small communities.[53] In 1978, Congress acted to phase out this subsidy by 1986 but enacted a new 10-year subsidy program for essential air service. Also in 1978, Congress authorized a new program of aid to intercity buses.[54]

In the case of highways, a trust fund is used to account for collections of user fees imposed on fuel, lubricants, vehicles, parts and other vehicle-related items. These fees do not vary directly with the costs imposed on particular segments of highways. In addition, numerous exemptions are given, the most recent (in 1978) to intercity buses.[55]

The country's highways are financed by all levels of government. Federal trust fund receipts are used to support scores of categorical highway-aid programs, undertaken and partly financed by state and local agencies. A similar trust fund is used to account for grants for airport construction, with revenues provided by such Federal user fees as passenger ticket and freight way-bill taxes. Tolls are generally forbidden on federally funded highways. Exceptions include structures such as bridges, in which case tolls must be eliminated once the facility has been amortized.[56] Because tolls cannot be continued, they cannot be used to cover maintenance costs or to affect congestion. At the same time, tolls are applied on the federally funded Saint Lawrence Seaway[57] and on the Panama Canal.

Federal funds are provided for rail/highway grade separation or protection.[58] At issue is whether the level of funding is sufficient to meet projected needs, and the extent to which highway user fees should be applied to fund such categorical programs involving other modes.

Federal funds are used to construct, operate and maintain the country's inland waterway navigation system.[59] The general public paid for these navigation projects (i.e., the cost was not even partially recouped by user fees) until Congress passed, in October 1978, a program of collecting fuel taxes from waterway users.[60] The new waterway fees are designed to cover a portion of operating costs of the inland waterways, but will not provide revenue sufficient to cover capital costs (e.g., for improvements at the Alton, Illinois Locks and Dam No. 26).[61]

Ownership and Operations

The DOJ cites competition as a fundamental economic policy which it seeks to implement.[62] As noted in previous sections, the Justice Department has often criticized transportation regulatory agencies. Implicit in the concept of competition is the belief that a government should not provide services in the marketplace except where the private sector is unwilling or unable to provide such services. However, some intercity transport policies and programs are to the contrary. For example, the Department of Defense (DOD) owns a small fleet of rail cars (Defense Freight Railway Interchange Fleet) used to support unique shipping requirements.[63] These cars may be provided free of charge to other government agencies, and to commercial firms at a fee, when not required for DOD use.

Similarly, the U.S. Army Corps of Engineers owns a fleet of dredges to maintain and construct authorized channel widths and depths, and it owns and operates locks and dams on U.S. waterways. Although private firms are used when their costs do not exceed by 25 percent the Corps' costs, the Corps' dredges perform 40 percent of this dredging, placing this government-provided service in direct competition with privately-owned dredges.[64]

While the Federal government has found it necessary to own and operate (at a loss) the Alaskan railroad,[65] the FRA Administrator has stated that adequate rail service—not the survival of every railroad—is FRA's overall goal for the U.S. rail system.[66] Finally, the FAA provides systems of air traffic control, navigation aids, and flight information.[67]

Planning and Information

In recent years, the Federal government has encouraged intercity transportation planning, usually on a modal basis. For example, as a condition of eligibility for rail assistance, states are now required to provide state rail plans, and the FRA has published a detailed State Rail Planning manual.[68] The FAA develops a National Airport System Plan, which is a compilation of development needs of U.S. civil airports.[69] The FAA also provides grants to public agencies to assist in planning a nationwide system of airports.[70]

In general, DOT does not engage in long-range transportation planning, but many of its administrations require planning as a condition for receipt of Federal aid.

Government Organization

While there are often good reasons for involving several agencies in decisionmaking and review processes, the actions of one agency often contradict actions of another. Even where contradictions do not exist, the mere involvement of several agencies can slow decisionmaking and review.

For example, numerous agencies are involved with Amtrak affairs, including the DOT, which annually submits recommendations to the Congress; ICC, which investigates and mediates disputes between Amtrak and the rail carriers, and may impose settlements based on its findings; GAO, which periodically audits Amtrak; and the President, who appoints a majority of the Board of Directors.[71]

Railroads have attempted to negotiate special rates to transport hazardous materials, including radioactive wastes, which require special handling. An ICC administrative law judge ruled that this was a safety matter and should be brought before DOT and the Nuclear Regulatory Commission (NRC), not the ICC. At the same time, DOE (formerly as the Energy Research and Development Administration) argued that such rates would hamper attainment of U.S. energy goals.[72]

In its efforts to promote competition in intercity transportation, the DOJ has challenged the ICC by recommending free motor carrier entry, an end to rate bureau antitrust immunity, and an end to ICC's control of mergers and approval of maximum rates.[73]

The Federal role in the intercity transport market, though not necessarily the level of Federal funding, is greater than in the other markets subsequently to be discussed. This seems to be an appropriate and natural outgrowth of the responsibility of the Federal government in a union of 50 sovereign states to ". . . regulate Commerce with foreign nations (and) among the several States. . . ."[74]

Federal involvement in intercity transport has historically used the tool of economic regulation. In the past 20 years, though, the Federal role increased considerably as Federal funds (from user charges and general revenues) began to flow to state and local governments, and to private carriers. These Federal funds are leveraged (that is, they often require recipients to share in the funding), which serves to expand Federal influence beyond the magnitude of its own financial involvement. In the last few years, with the advent of Amtrak and Conrail, Federal involvement has taken an even bolder step.

In summary, NTPSC found 17 congressional committees and 52 Federal agencies involved in policy development and program implementation in the intercity market. NTPSC identified 338 policies and 346 programs with relevance to intercity transportation.

THE URBAN MARKET

This section discusses Federal transportation policies affecting the urban movement of passengers and freight and the programs developed to implement these policies.[75]

The urban market is characterized by great demand for personal mobility, as well as for the movement of goods, and by relatively short trip lengths for both people and goods. For this report, the urban market is defined as encompassing movements within places of at least 2,500 population and includes daily commutation from surrounding areas.

Many Federal programs define an urban market as having at least 50,000 residents. By this more restrictive definition, the urban market contains approximately 60 percent of the U.S. population. An additional 15 percent is covered by Federal programs for which the 2,500 population threshold is applied. Transportation problems are often different in large cities, as contrasted with smaller communities, so that, depending on the issue, one definition or the other may be more appropriate.

Regulation

ECONOMIC REGULATION

Federal economic regulatory activity in the urban market is unusual in its limited scope. Local transit regulation is left to the discretion of state and local governments. Even when a metropolitan area straddles a state line, the ICC exempts freight carriers from its economic control for movements within a commercial zone.[76]

The Federal government does, however, regulate the economic activities (both operations and capital investment) of some urban transit providers through conditions attached to the receipt of Federal financial assistance. Federal aid for the purchase of buses is conditioned on prior agreement that the buses will not be employed in charter operations ". . . outside of the urban area (or areas) within which . . . regularly scheduled mass transportation service" is provided.[77] Federal policy also does not require local transit operators to set fares so as to cover operating costs, because (within limits) Federal operating assistance varies directly with local deficits.[78] Such operators must also charge fares at least one-half lower than their standard fares for elderly and handicapped persons during off-peak hours.[79]

OTHER REGULATION

Non-economic regulation by the Federal government is considerably more pervasive than economic regulation in the urban transport market. Most of these regulations are essentially strings attached to Federal assistance programs. For example, the DOT Secretary has ruled that as a means of insuring equity and providing adequate service, new mass transit vehicles purchased with Federal assistance at some future date must be accessible to the handicapped and the elderly.[80] As this requirement is attached to the receipt of Federal funds, a transit operator might avoid the regulation by refusing to accept the aid.

Such accessibility requirements conflict with attempts to minimize Federal subsidy to urban transit systems. This is because many areas are already providing specialized, demand-responsive transportation to meet the needs of the elderly and handicapped. Special systems, or even taxi service open to all users, often can be operated for less than the cost involved in providing full accessibility to regular, fixed-route urban transit.[81] The conflict is more pronounced when it is considered that many areas may be required to continue to provide the specialized services, in addition to an accessible fixed-route transit system, to meet the needs of the elderly and handicapped.

Section 504 of the Rehabilitation Act of 1973 requires that:

> No otherwise qualified individual in the United States . . . shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving Federal financial assistance.[82]

UMTA estimates that the cost for transit of complying with Section 504 will be $1.7 billion,[83] in 1977 dollars, and the urban transit industry claims compliance costs will be as much as $6.5 billion.[84]

Another example of regulation achieved by attaching conditions to the receipt of Federal funds is Section 13(c) of the Urban Mass Transportation Act of 1964. Section 13(c) protects employees of urban transportation projects that receive Federal funds by insuring ". . . against a worsening of their positions with respect to their employment. . . ." Employees are guaranteed maintenance of collective bargaining rights and other privileges, job protection or priority reinstatement if laid off, and paid training.[85]

There are numerous other Federal regulations which affect transportation in the urban market. These regulations include automobile emission standards,[86] the 55 m.p.h. speed limit,[87] brake standards,[88] and fuel economy standards.[89] All such regulations can affect the quantity and quality of transportation services available in the urban market.

The Environmental Protection Agency (EPA) is authorized to set noise emission standards for products distributed in commerce. At present, only motor carriers weighing more than 10,000 pounds are so regulated.[90] No Federal noise standards are set for smaller trucks and automobiles. EPA has proposed noise regulations for motorcycles, however.[91] The conflict between these regulations and the goal of low transportation prices is demonstrated by EPA's own estimates which suggest that compliance with these regulations will drive up motorcycle costs by 10 percent. At issue is whether such costs are outweighed by the value to society of a quieter environment.

The regulation of safety in urban rail transit falls somewhere between the jurisdiction of UMTA and the FRA. A recent U.S. Court of Appeals ruling gives UMTA sole jurisdiction of safety in mass transit.[92] The ruling overturned a lower court holding that FRA had jurisdiction over safety aspects of the Chicago Transit Authority's (CTA) rapid transit operation.[93] The jurisdictional dispute is not yet fully resolved, as the court ruled CTA rail operations to be outside that which Congress intended in the Railway Safety Act of 1970. Questions remain whether the court would rule similarly for the Lindenwold (Philadelphia area) or other northeastern commuter lines which more closely resemble intercity rail service.

The Consumer Product Safety Commission regulates bicycle safety by establishing standards for bicycle design and attachments.[94]

On the freight side of the urban market, a few policies have been focused on the movement of hazardous materials through densely populated urban areas.[95] Federal policy does not yet address such urban freight safety issues as designing routes by rail, highway, and water to minimize exposure of people and property; assuring the development of local plans to respond with the necessary resources when a disaster occurs; or maintaining a general Federal readiness to provide disaster assistance.

Finance, Pricing, and Taxation

In recent years, major Federal financial assistance has been provided in the urban market. For example, the Federal-Aid Urban System (FAUS) is funded by a categorical highway program tailored specifically to meet urban needs.[96] The dollar allocation to each state for the FAUS program is based on the state's share of total U.S. population residing in urban areas. With approval of state authorities, FAUS funds can be used either for transit capital projects or for urban highways. (Despite the apparent flexibility of this program, few FAUS funds have been used for transit.)[97] At issue is the extent to which highway user fees paid by truck operators and motorists should be used for public transit or for urban highway systems that largely serve auto commuter traffic.

Another FHWA program which directly affects urban transportation is the bikeways program, allowing states to construct separate or preferential bicycle paths or lanes, shelters, and parking facilities to serve persons using bicycles.[98] States also may elect to use their Federal-aid highway funds for vanpool projects.[99] Federal funds can be applied for vehicle acquisition, start-up costs, and guarantees against financial losses. Users are required to pay a fee that covers vehicle depreciation and operating expenses. FHWA regulations require that vanpool projects not have an adverse impact on mass transit. This is, however, a difficult assurance to give and some diversion is likely to occur, placing the vanpool program in conflict with Federal funding of transit. Congress created two additional categorical programs for bikeways and vanpools in 1978 in the same act in which it expanded urban transit aids.[100]

Urban transit capital projects may be substituted for a previously approved portion of the Interstate Highway System in an urban area.[101] State and local officials, acting together, must request the transfer. The DOT Secretary must assure that the segment to be deleted is not essential, and the Governor of the state must assure that a toll facility will not be substituted. If a transfer is approved, the Federal share is 85 percent, although the Federal share for the Interstate project would have been 90 percent. The Federal share for transit capital assistance is 80 percent. This difference in matching ratios results in some conflicts at the local level by making highway construction financially more attractive, even though transit may better fit local needs. When a transfer is approved, or transit assistance is awarded, general funds are used for the Federal share, whereas funds for the Federal share of expenses for the Interstate Highway System come from the Highway Trust Fund.

UMTA funds planning, equipment and facility purchases, and operating deficits for a variety of public modes including subways, streetcars, commuter railroads, buses and paratransit. Discretionary grants are made to public bodies to help transit systems acquire capital facilities and equipment; the Federal share is 80 percent.[102]

UMTA required grant recipients to choose the lowest bidder for capital grants projects, regardless of the nationality of the company producing the equipment. However, Congress modified this policy in October 1978 by applying a "Buy America" requirement to projects with total cost in excess of $500,000, unless a waiver is granted by the Secretary of Transportation.[103]

UMTA distributes formula grants directly to cities of 200,000 population and above, and to governors for cities between 50,000 and 200,000 population.[104] Funds may be used for operating assistance (with a Federal share of 50 percent) or capital assistance (with a Federal share of 80 percent). Eligibility for UMTA formula grants for operating assistance was contingent upon maintaining non-Federal, non-fare revenue (such as state and local subsidies and advertising revenues) at a level at least as great as the average of the past two years,[105] although this maintenance-of-effort policy is being phased out as a result of congressional action in 1978. A new program of transit aid to small urban (and rural) areas was begun by Congress in 1978, so that for the first time cities of less than 50,000 population are eligible for transit operating funds, as well as capital funds.[106]

Federal funds are also provided to subsidize operating losses of commuter rail service. Originally this program was for commuter services in the Northeast. In 1977, a new program was created to provide more extensive subsidy payments to commuter rail services. The Federal share for both programs is 80 percent.[107]

A variety of additional Federal policies and programs affect the urban market. For example, DOD and the General Services Administration assist in the construction and maintenance of access roads to military and civilian facilities.[108] Also, a substantial transportation network is operated throughout the District of Columbia and its suburbs by the Washington Metropolitan Area Transportation Authority (WMATA). Although WMATA is not a Federal agency, it has received substantial Federal aid in a form that is quite different from that of other transit authorities (e.g., Congress continues to appropriate separate funds to cover 25 percent of WMATA's interest expense on bonded indebtedness).[109]

The largest amount of non-DOT financial assistance to suppliers of urban transport is provided by the Treasury Department and the Department of Health, Education and Welfare (HEW). Substantial block grants go to state and local governments to be used within relatively broad categories, including transportation-related expenses in the urban market.[110] Direct financial assistance for city governments administered by the Treasury (e.g., countercyclical assistance and general revenue sharing) may be used, with few strings attached, for transport purposes.[111] Even when Federal revenue sharing money is not spent directly on transportation, its availability may permit local governments to spend more of their own funds for transportation.

The policies and programs of the Department of Housing and Urban Development (HUD) provide additional examples of non-transportation actions by the Federal government which heavily impact upon the urban market. HUD programs include grants, loans, and loan guarantees to local agencies and individuals for the construction or improvement of homes, businesses, and public facilities.[112] Some analysts believe these policies and programs have contributed to urban sprawl and central city blight to a greater extent than the construction of freeways and other transport facilities.[113] Whatever forces shape cities, the resulting urban form molds both travel demands and the characteristics of transportation systems which can serve those demands.[114]

The Federal tax code has also impacted the type and distribution of activity and related transportation needs in urban areas. It has been suggested that deductions for interest payments on mortgages and for local property tax payments may have encouraged home ownership compared with higher-density (usually rental) habitation in urban areas.[115] Rapid depreciation of buildings for tax purposes may have influenced urban form. The deduction permitted on Federal income taxes for state and local fuel taxes has been ended by Congress beginning with the 1979 tax year.[116]

In the more recent past, the Federal government, through HUD (by aiding housing renewal projects in urban areas)[117] and through the Economic Development Administration of the Department of Commerce (by financial assistance for businesses in central cities),[118] has encouraged a return to central cities. These particular non-transportation policies, together with implementation of President Carter's urban policies,[119] could, through increased densities, make urban transit more viable. Transit, by encouraging development at major terminals or subway stops, can promote density. On the other hand, local government may be reluctant to permit dense development, and transit extension to suburban areas can promote sprawl. President Carter's urban policy, calling for urban impact statements for proposed Federal actions affecting cities, and UMTA's investment analysis requirements,[120] encourage local governments to consider the costs and benefits of various development patterns induced by the use of Federal funds.

The Federal government further affects urban land uses—and related transportation needs—by funding non-transportation infrastructure related to water supply, flood control, sewage treatment projects, hydro-electric projects, and the like. The Federal government also affects urban transport by locating Federal facilities in urban areas. The location of Federal offices and defense installations can substantially affect commutation patterns. Social-recreational trips are also affected by urban parks and historic sites supported or administered by the Department of the Interior.[121]

Ownership and Operations

The Federal government has generally refrained from becoming the provider and operator of transit services in the urban market. Some transportation services (primarily through programs funded by HEW and the Community Services Administration—CSA) are provided with direct Federal aid. CSA, previously the Office of Economic Opportunity, has funded transportation services in urban and rural areas to accomplish its program objectives.[122] These systems may be small, underutilized, run by inexperienced persons, and in competition with existing transit services, especially those of private taxicab firms. CSA is seeking to demonstrate ways that more coordination can be achieved.[123]

Most Federal aid for capital and operating assistance can be provided only to publicly-owned transit operations.[124] As a result of these requirements, and for other reasons, the public has taken over transit operation in many urban areas since the Federal program of transit grants began in 1964.

Planning and Information

The Federal-Aid Highway Act of 1962 specified that a "3C" (continuing, comprehensive, and cooperative) planning process be carried out by the states and urban areas with populations greater than

50,000.[125] The Federal-Aid Highway Act of 1973 required states to appoint metropolitan planning organizations (MPOs) to oversee the "3C" process and to coordinate planning funds from different Federal agencies.[126] Transportation Improvement Plans (TIPs) are now developed by MPOs to augment the "3C" process. A TIP may contain a long-range section and a 3- to 5-year short-term segment with an annual element. Measures to improve transportation using low-cost methods such as signalization and left-turn lanes are also encouraged. These are to be listed in the Transportation System Management (TSM) component of the TIP's annual element.[127]

Research of interest to urban transport operators is performed by the modal administrations of the DOT plus its Research and Special Programs Administration. Both FHWA and UMTA have developed analytical models, computer software and other tools to assist urban transportation planners and operators. These agencies also sponsor seminars and training programs for potential users of these tools for planning, management and operations. The DOD, Transportation Research Board (which is partially sponsored by the Federal government), congressional offices and committees, and occasional Federal study commissions, also facilitate urban transport research. Specifically, a variety of agencies monitor the variables which are important to the demand for transportation. Key programs include HUD's annual housing survey, the Census Bureau's decennial censuses of housing and population and quinquennial census of transportation,[128] and various forecasting programs under other branches of the Department of Commerce. Data, methods, and results are usually made available by the sponsoring agency, the Government Printing Office, or the National Technical Information Service.[129]

It seems that innovations involving high technology (such as computerized traffic control systems, fully automated transit vehicles, and computerized property control, scheduling, and management systems) plus new propulsion concepts have, in the past, received the most serious attention for UMTA demonstration projects.[130] Some observers suggest that innovations requiring relatively small investments (such as package delivery by taxis, use of rental car fleets as paratransit, and preferential treatment of buses) could have high payoffs in the short term and might be given higher priority under demonstration programs to achieve more cost-effective results. However, it seems that local sponsors have been reluctant to seek federally funded demonstrations that might impinge on auto use.

Government Organization

The Federal government recognizes the need for coordination among the numerous public policies and programs in urban areas. Such coordination has sometimes been difficult to achieve because of disjointed political jurisdictions within an urban area.

In addition, lack of coordination at the Federal level has resulted in redundancy. This is illustrated in the urban market by a recent critique of HEW and other programs issued by the GAO.[131] Scores of HEW programs supply or fund transportation for clients to travel to service centers. As a result, a variety of small transportation services may continue to operate well below capacity within one urban area.

Federal involvement in urban transport has grown dramatically during the past two decades. The continuing implementation of stricter non-economic regulations (e.g., noise and air emission standards, fuel economy standards, and safety standards) will serve to increase the demand for Federal financing of urban transportation. These regulations will also serve to make the expenditure of additional funds in the urban market easier to justify.

In summary, 13 congressional committees and 46 Federal agencies have been identified by NTPSC as having jurisdiction which affects the urban transportation market. NTPSC found 162 policies and 357 programs with relevance to the urban market.

THE RURAL MARKET

This section discusses Federal transport policies and programs affecting the movement of passengers and freight in the rural market. The rural market is defined as transportation within and between places of less than 2,500 population. This includes many U.S. parks and forests, Indian reservations, and farms. Movements from rural points, to or from urban markets, are generally labeled rural, although, depending on the particular context, such movement might be considered urban (commuting to work) or intercity (dense freight movement).

Regulation

ECONOMIC REGULATION

The ICC regulates the entry, exit, and rates of motor, rail and water carriers (although much rural traffic by motor or water carriage is agricultural, and exempt, moving in bulk, or hauled by private carrier). Agricultural cooperatives are, however, singled out for special treatment and are exempt from ICC regulation of motor carrier entry and rates under certain conditions.[132] Alleged abuse of this exemption recently led the ICC to ban one-way trip leasing by co-ops to non-members for non-farm business, in an effort to curtail "sham" co-ops that lease their vehicles and thereby effectively compete with common carriers. This ICC policy is being challenged in Federal Court by some of the co-ops.[133]

The ICC prohibits independent truck operators (not holding their own operating rights) from carrying regulated commodities unless they have a trip-lease agreement with a certificated carrier.[134] The terms of such agreements may discourage the non-certificated trucker from trip-leasing and, therefore, the independent trucker's exempt haul in one direction may be accompanied by an empty return haul because it is unlikely that agricultural commodities would be available for both directions of a trip.[135] This results in conflict with national energy conservation goals. The ICC, with DOJ support, also prohibits independent truckers from publishing rates.[136] This ICC policy conflicts with the Department of Agriculture's position that independents should publish rates so that farmers and shippers can make use of the lowest-cost transportation available. The Justice Department has threatened prosecution of agricultural truckers that publish "suggested" rate sheets for hauling ICC-exempt commodities.[137]

The ICC maintains varying degrees of control over route abandonment by carriers which it regulates. ICC control over rail abandonment is more strict than for other modes. Under the 4R Act, early notice by railroads of proposed abandonment is required.[138] A complete system map showing lines to be abandoned within three years must be filed with the ICC and the states.

Opponents of efforts to deregulate the motor carrier industry (for both passengers and freight) often state the likelihood of deteriorating service to small communities, if such changes were made. Discontinuation of service by motor carriers to small communities has not been carefully controlled by the ICC, however.[139]

The CAB has regulated entry, exit, and fares of most intercity air carriers. The CAB has not, however, strictly regulated air commuters, air taxis, or private general aviation, which are especially important to the provision of air service in the rural market.[140] To be exempt from regulation, a commuter or air taxi must restrict itself to the operation of small aircraft (previously a maximum capacity of 30 seats and a maximum payload capacity of 7,500 pounds, although these limits were changed in 1978 to 56 passengers and 18,000 pounds). These air carriers are subject to the FAA's safety regulations. Air taxis and commuters were not eligible for the CAB subsidy paid to local service airlines (even though certain commuters may enplane more passengers and operate in a more efficient manner) until Congress changed its policy in October 1978.[141]

OTHER REGULATION

Non-economic regulation of transport in the rural market is virtually the same as for the intercity and urban markets. Pursuit of development goals for the rural market may often conflict with Federal restrictions imposed to protect the environment. Congress has adopted a compromise set of regulations for Minnesota's boundary waters wilderness areas that permits the use of motor boats on only a few lakes and severely restricts the use of snowmobiles.[142] Local residents opposed such restrictions as infringing on their mobility and economic well-being.

Finance, Pricing and Taxation

UMTA has administered a $500 million capital-grant program for transit projects for cities under 50,000 population,[143] but these smaller cities were not eligible for assistance to help cover operating deficits, as provided in the 1974 National Mass Transportation Assistance Act for cities of over 50,000 population.[144] The result was a policy gap between the small urban and rural markets and the urban market. Congress acted in October 1978 to give more transit aid to rural and small urban places and established special categorical programs to permit transit and highway improvements resulting in better service.[145] Authorized aids now, for the first time, include the intercity bus mode, which often provides the only form of public transport in rural areas.[146]

Capital grants are also available through UMTA's 16(b)(2) program to private non-profit groups for specialized transportation services for the elderly and handicapped in rural and urban areas.[147] The 16(b)(2) program has funded more than 3,000 vehicles, many of which operate in rural areas. It is alleged that such vehicles, like those funded through other Federal programs (e.g., HEW's Older Americans Act Titles III and VII),[148] have been used to compete with established, privately owned, for-profit transportation firms.[149]

The FHWA manages several highway programs of particular importance in the rural market. The Bridge Inspection and Replacement Program mandates standards and requires biennial inspections.[150] Federal funds are authorized to cover 80 percent of the cost of replacing certain structurally deficient and functionally obsolete bridges. Many of these bridges are not part of the Federal-Aid Highway System, but rather are on state and county roads in rural America. Congress acted in October 1978 to greatly increase the categorical funds available for bridge replacement.[151]

Section 803 of the 4R Act created an FRA program to help states continue rail branch-line service, rehabilitate facilities, and replace lost service by less costly means.[152] A separate program is administered by FHWA for rail/highway grade improvement or separation projects, providing funds with a 90 percent Federal share.[153] Aid for branch lines was limited to those approved for abandonment, giving no incentive to seek ways to prevent abandonment in the first place. Congress acted in 1978 to make the subsidy program permanent at a matching ratio of 80 percent Federal, 20 percent non-Federal and to permit some funds to be used to *prevent* abandonment.[154]

The National Scenic and Recreational Highway program (Great River Road) funds 10 states along the Mississippi River to provide a scenic route for leisurely automobile travel.[155]

The Forest Service of the Department of Agriculture is responsible for designing and constructing a road system in national forests consistent with sound policies for managing forest lands.[156] It appears that Forest Service planning and engineering of these roads is duplicative of DOT capabilities, as FHWA has designed few such roads. Private lumbering firms contract for construction of roads in national forests.[157]

The Appalachian Regional Commission (ARC) provides 70 percent Federal grants to states in the region for design and construction of highways, although the ratio may be increased to 80 percent by the ARC as a result of recent congressional action.[158] The primary purpose of these highways is to provide access to rural Appalachia as a means of fostering economic development. Highway investments seeking such a goal may be different from those investments guided by a goal of strict economic efficiency.

Through the U.S. Army Corps of Engineers, the Federal government provides 50 percent of the cost of construction of general navigation facilities serving recreational boat traffic and the full costs of operating and maintaining navigational aspects of small boat harbors. Non-Federal interests bear one-half of construction costs and provide all lands, easements, rights-of-way, public wharf servicing, necessary policing, and other essential services.[159]

The Treasury Department administers the general revenue sharing program which provides Federal block grants to state and local governments.[160] Rural counties and cities rely on these funds for transportation purposes. Overall, it is estimated that as much as 15 percent of the revenue sharing funds is spent on transportation-related services of state and local governments.[161]

Ownership and Operations

The Federal government, primarily through Action, the Community Services Administration (CSA), and HEW, provides transportation services to the rural disadvantaged. These services exist primarily to transport the elderly, the poor, the handicapped, and other disadvantaged citizens to locations where they can obtain social services which they need. HEW alone has over 65 programs with annual expenditures of $800 million to provide such transportation services in rural (and urban) areas.[162] Throughout the rural and urban markets, the provision of special transportation services by several agencies can encourage the proliferation of small, underutilized, uncoordinated, and duplicative services.

Several forms of Federal involvement are evident in Alaska's transportation system. The FRA owns and operates 482 miles of railroad, in addition to riverboats, to provide transportation services to rural Alaska.[163] A federally funded facility, the Alaskan Highway, also exists (originally designed primarily for defense purposes).[164]

Planning and Information

The 3R and 4R Acts thrust the states and local governments into rail planning activities as a condition of eligibility for state rail assistance from the Federal government. Congress acted in 1978 to establish a Rural Transportation Advisory Task Force to report on ways to achieve better transportation in a more coordinated manner.[165]

The movement of agricultural resources and products almost always involves a combination of modes. This signals a gap as there are no Federal requirements for intermodal rural transportation planning. The Transportation Research Board (of the National Research Council of the National Academies of Sciences and Engineering) administers research on rural multimodal planning, including a National Cooperative Highway Research Program study of statewide, multimodal, freight-demand forecasting.[166]

A major problem in the rural market is that the definition of "rural" varies by agency and program. For example, UMTA's capital grant program sets aside funds for small cities of between approximately 2,500 and 50,000 population,[167] but FHWA's Section 147 rural highway public transportation demonstration program was directed (with some exceptions) to places of up to 5,000 population.[168] The U.S. Census Bureau defines rural areas as those remaining areas not consisting of places of 2,500 population or more, and not at the densely settled fringe of urbanized areas.[169] Due to confidentiality requirements, detailed data for particular geographic units within sparsely populated rural areas may not be available from the Census Bureau.[170] Such data, if made available, might prove useful to planners of rural public transportation.

Government Organization

NTPSC identified 17 congressional committees and 51 Federal agencies that have jurisdiction of importance to the rural market. NTPSC found 243 policies and 404 programs relevant to rural transportation.

THE INTERNATIONAL MARKET

Transport in the international market encompasses carriage of all passengers and goods across national boundaries, except traffic between domestic ports via international routes. Governments enter the international market as regulators, suppliers, and consumers of transportation. Market intervention is couched in terms of national defense, promotion of peacetime national objectives, protection of citizens, realization of foreign exchange earnings, attainment of economic efficiency, and promotion of local industry. The inability of individual governments to regulate externalities which affect the welfare of other nations has given rise to a variety of United Nations-sponsored intergovernmental organizations (such as the Inter-Governmental Maritime Consultative Organization—IMCO). These organizations have been instrumental in setting transportation safety and environmental standards.

Regulation

ECONOMIC REGULATION

The scope of regulatory power and jurisdiction differs greatly between the maritime and aviation industries. Federal maritime regulation (by the FMC) is much less pervasive than in the aviation industry, even after substantial air deregulation in 1978. Entry and exit of individual carriers into the shipping field are based totally on economic factors and are not subject to regulation. Although membership in the rate-fixing associations of steamship liners (conferences) has been made immune to antitrust action,[171] to insure competition and improve service, the U.S. has insisted that the conferences remain open to any carrier willing to take part in the trade. The Maritime Administration (MarAd) in the Department of Commerce regulates the routes of U.S.-flag carriers receiving subsidies under the various financial programs which it oversees.[172] Rates are set by the liner conferences. Although the FMC has the power to disapprove rates following a hearing showing that they are predatory or unjustified on cost or other grounds, the power is rarely used. Such hearings have taken an average of two years.[173] The costs of foreign-flag vessel operations may not be easily obtained, so that determining whether rates are below cost may be impractical in these cases.[174]

Because the U. S. is the only major trading nation which insists on open conferences, ships which have been kept out of closed conferences in other parts of the world have come to the U.S. trade. Worldwide excess capacity, produced by competitive government subsidies and by other factors, has resulted in some U.S.-flag carriers experiencing economic difficulties.[175]

Regulation of aviation routes, entry, exit, and fares is much more complete than for the maritime sector. Airline entry in the international market is tied to a process of bilateral negotiations. Responsibility for the designation of U.S. air carriers to the routes gained as a result of bilateral negotiations is delegated to the CAB.[176] CAB route designations can be overturned by the President for foreign policy reasons. The President was also empowered to award a route to another carrier after deciding to overturn a CAB decision,[177] a power which was ended by Congress in 1978.[178]

Development of rates has generally been left to the carriers in the International Air Transport Association (IATA). The CAB has the right to suspend proposed rates if it feels that they are discriminatory or unjustified, but it may not put alternative rates into force.[179] In 1978 the CAB indicated that it may not accept rates determined within IATA, considering them to be anti-competitive. Subsequently, members of IATA altered its structure to permit individual members to set their own rates while retaining membership; nonetheless, IATA has challenged this CAB policy.[180]

U.S. international aviation and maritime policies both nominally stress the benefits of competition based on the premise that market competition will cause inefficient operators to improve or leave the market and allow efficient operators to provide service at prices reflecting costs. However, national defense, prestige, balance of payments considerations, and other concerns affect both U.S. and foreign-flag carriers, so that open competition may not drive out many marginal operators. Interpretations of national interests tend to make it impossible to accept the demise of a flag carrier and result in subsidy.

Finally, U.S. attempts to regulate practices of other flag carriers have met with resistance from foreign countries. U.S. restrictions on rate-cutting, rates below costs, and rebating by liners involved in U.S. trade have met with legislation in some countries which prohibits their carriers from cooperating with the U.S. initiatives. As a result, the regulations have been stringently applied only to U.S. carriers, even though the CAB and the FMC are empowered to bar U.S. ports to flag carriers of nations which discriminate against U.S. carriers.[181]

The U.S. International Trade Commission investigates injuries that may result from dumping (the practice of selling below cost),[182] including the dumping of transportation equipment. U.S. firms and labor which have been displaced by competition may receive counseling and some short-term funding under programs of the Department of Labor.[183]

OTHER REGULATION

Enforcement of congressionally mandated environmental standards and safety regulations comes under the jurisdiction of the U.S. Coast Guard and the FAA.[184] Certain Coast Guard standards apply to the water carriers of all nations at U.S. ports of entry, although in practice some standards may be more strictly applied to U.S. carriers than to foreign-flag carriers due to possible ill effects on foreign policy.[185] A more beneficial approach might be the multilateral application of uniform standards (e.g., those of IMCO). Rulemaking by the U.S. Coast Guard has formalized certain of these IMCO standards.[186]

Finance, Pricing and Taxation

Programs which affect the supply of U.S.-flag transportation include a variety of subsidies under the auspices of MarAd. U.S. shipyards are aided through construction differential subsidies which equalize the costs to the buyer of ships built in the U.S. with those built in foreign countries. Federal support is limited to payment of a maximum 50 percent differential.[187] The maritime sector is aided through government-guaranteed loans under the Federal Ship Financing Guarantee Program.[188] Additional capital is made available for investment in the U.S. maritime industry through tax deferral options granted to shipowners and operators under the Capital Construction Fund[189] and the Construction Reserve Fund.[190] The higher cost of using American labor to crew U.S. ships is partially offset by the Federal government through operating differential subsidy.[191]

Compared to the U.S., other countries rely more on indirect subsidies, inflation offsets, tax moratoria, and the like. A different form of indirect financial aid is given to both U.S. international airlines and ocean liners through the observance of "buy American" cargo preference policies, preserving 50 percent of U.S. Government commercial cargo and 100 percent of U.S. military cargo for carriage by U.S.-flag carriers.[192] For example, two Federal programs, foreign agricultural aid as provided in Pub. L. 83–480, and the sale of military equipment abroad, directly affect the financial status of U.S.-flag carriers as a result of "buy American" provisions. Preserving government cargo for U.S. carriers may result in higher prices for shippers.[193] The Jones Act restricts U.S. domestic waterborne traffic to U.S. ships, but the Virgin Islands are exempt.[194]

U.S. air carriers receive little Federal aid for international operations. The authority of the FAA to provide equipment-loan guarantees lapsed in 1977, but was renewed by Congress in 1978, and government loans to aerospace manufacturers have been granted only under exceptional circumstances.[195] The health of the airline industry is monitored by the CAB, which has authority to subsidize the industry indirectly by approving rates for the carriage of international mail by U.S.-flag carriers. These rates, if CAB so ruled, could reflect the fact that foreign carriers generally receive compensation for carriage of mail according to Universal Postal Union rates, which are higher than U.S. Postal Service rates.[196]

Demand for U.S.-built aerospace products is aided by loans and guarantees afforded foreign investors by the Export-Import Bank.[197] These loans are often made to finance foreign purchases of U.S.-built aircraft.[198] Such loans run the risk of placing the U.S. in competition with other countries to provide greater levels of subsidy.

Both aviation and maritime statutes state the need to ensure the survival of a healthy, privately-owned commercial fleet for reasons of national security. Maritime subsidies have been granted to the U.S. Merchant Marine (and, in the past, subsidies have gone to international air carriers) for reasons of national defense and security. Many container ships, very large crude carriers, and liquified natural gas carriers, some of which are built and operated under Federal subsidy, may require extensive port facilities or deeper and wider waterway channels. However viable such ships may be in the commercial market, their worth to the military in the event of mobilization is questioned by the DOD. The agency reports that modern ship types such as roll-on, roll-off (RO/RO) are especially efficient in transporting military equipment.[199] On the other hand, subsidized vessel design features incorporated to improve military usefulness are not reimbursed from the DOD budget.[200]

Ownership and Operations

With the exception of Federal ownership and operation of Dulles International Airport[201] and systems of air traffic control, navigation aids, and flight information,[202] Federal involvement in the provision of international airport facilities is limited to financial aid. Currently the Federal financial share in the planning and construction of air carrier airports is 75 percent.[203] Grants are made from the Airport and Airways Trust Fund[204] at the discretion of the FAA.[205]

The Department of State, with CAB and DOT assistance, represents American interests in bilateral aviation negotiations.[206] The State Department also leads negotiations of cases dealing with expropriation and seizure of goods and vessels.

Federal involvement in the provision of water port facilities is relatively small. Ports are either privately-owned or are owned and operated by local, state, and regional authorities, rather than by the Federal government.[207] The Economic Development Administration provides some funds for port construction, perhaps more than 5 percent of total port investment.[208]

For reasons of safety, all navigation aids are maintained by the U.S. Coast Guard in harbors and along coasts and inland waterways.[209] In addition, the U.S. Army Corps of Engineers provides dredging services for the nation's ports.[210]

Planning and Information

Most coastal states are formulating plans pursuant to the provisions of the Coastal Zone Management Act.[211] Once plans are approved, new port development will occur in accordance with these state plans. The Deep Water Port Act of 1974 gave coastal states the authority to veto offshore terminal developments affecting their coasts.[212]

Lack of coordination is a problem endemic to the international transportation field. There exists no single formal group or agency to which matters concerning international transport policy can be addressed, either within the U.S. or in an international forum. Lack of coordination also exists among the regulatory agencies responsible for overseeing the transport of U.S. cargo in international trade. While the FMC has jurisdiction over oceanborne cargo until it reaches U.S. shores, thereafter it becomes the responsibility of the ICC. Disparate rate regulations and liability requirements may serve to discourage the free flow of goods through intermodal channels.[213]

Regarding international coordination, the U.S. is active in the International Civil Aviation Organization (ICAO) because, as the leading aviation and aerospace manufacturing country, the U.S. has strong interest in the coordination of aviation standards. Pressure has been growing from many nations to shift ICAO's emphasis from technical to economic issues (such as fares and rates, capacity, and the role of non-scheduled airlines). The U.S. view with regard to economic issues in international aviation generally conflicts with the views of a majority of ICAO nations.[214]

Government Organization

NTPSC found 19 congressional committees and 47 Federal agencies whose jurisdictions impact the international transport market. NTPSC discovered 193 policies and 290 programs of the Federal government involving this market.

CONCLUSIONS

The U. S. has no unified "national transportation policy." Instead, there is an assortment of policies and programs which have been developed in an ad hoc fashion to achieve sundry goals or resolve various issues. The sheer bulk of Federal transport policies and programs (as demonstrated by NTPSC Special Report No. 6) is enough evidence to convince many observers of the ad hoc nature of Federal transportation policymaking. The NTPSC identified 64 Federal agencies that implement approximately 1,000 policies and programs.

An examination of Federal transport policies and programs reveals that there exist inconsistencies in the application of policies. For example, regulatory policies are not applied uniformly between markets, between modes, or even within modes. All for-hire modes, with the exception of air cargo, are subject to some form of economic regulation. Even when a mode within a market is regulated, Congress has authorized numerous exemptions. For example, both rail and motor carriers are regulated by the ICC, but motor carriers of agricultural commodities are exempt from regulation, while railroads carrying most agricultural commodities are not.

The Federal government often exempts itself from the policies which it imposes on its citizens. For example, railroads must obtain permission from the ICC to discontinue or abandon rail service, but Federally controlled Amtrak is exempt from this requirement. Similarly, commercial shippers of regulated commodities may negotiate contract rates with most regulated carriers, but they must abide by the published contract terms. Congress has exempted any government body in the U.S. from this restraint under Section 22 and similar sections of the Interstate Commerce Act.

An examination of Federal financial assistance reveals that Federal funding shares are not uniform.[215] Federal funding of 90 percent of the costs of the Interstate highway program, compared to 75 percent for the cost of most other Federal-aid highway programs, does reflect a considered decision to attach a higher priority to completion of the Interstate System. But the criteria used to determine Federal shares of 100 percent for pavement-marking projects, 80 percent for bridge-replacement projects, 90 percent for rail/highway grade-crossing projects, and 95 percent for rail/highway grade-crossing demonstration projects are not evident.

Examples of overlapping and conflicting jurisdiction of Federal agencies are numerous. For instance, the Forest Service of the Department of Agriculture, the National Park Service of the Department of Interior, the Appalachian Regional Commission, and the DOT's Federal Highway Administration all share road designing, building and funding responsibilities.

Conflicts exist where more than one agency claims jurisdiction over a particular matter, or when an agency publicly opposes the policies and programs of another. Both UMTA and the FRA are believed by various parties to have jurisdiction over rail safety. A recent court ruling held that UMTA, not FRA, has jurisdiction over rail safety for a particular urban transit operation.[216]

The DOJ and the Federal Trade Commission oppose many decisions of the FMC and the ICC as they relate to competition in water, rail, and motor carriage. The CAB's recent efforts to expand air competition have been generally supported by the DOT and FTC. The Department of Agriculture opposes the ICC's prohibition against rate publication by independent truckers, believing that such publication would insure lower rates to farmers and shippers.

Another conclusion which can be drawn from NTPSC research is that many non-transportation policies have a serious impact on the transport sector, yet potential impacts are not carefully considered in advance of the adoption of such policies. For example, Section 504 of the Rehabilitation Act of 1973 provides that no person shall be denied access to a federally funded program because of a handicap. This very important Federal policy may cost the Federal government an estimated $1.7 billion to bring about compliance in urban transit systems alone if current policies are implemented, while state and local governments and the private sector might also bear enormous costs.

Department of Housing and Urban Development home mortgage guarantee programs and Federal tax deductions for mortgage interest payments are examples of non-transportation Federal actions affecting transportation in the U.S. In one view, urban geography has been changed as a result of Federal actions such as these, by influencing highway development in urban areas and contributing eventually to the demand for Federal transit funds to alleviate congestion and pollution resulting from vehicle use.

Another conclusion to be drawn from a study of Federal transport actions is that the Federal government has no accurate calculation of its expenditures for transportation. The conventional Federal transport accounts consider only the most obvious examples of Federal aid. Other Federal actions which aid transportation are not usually measured in calculating the Federal role. Examples of these include general revenue sharing grants which are used by state and local governments for transport purposes (including providing the matching funds for other Federal categorical programs); social service programs which provide transportation services or funds for clients to purchase such services; and the Comprehensive Employment and Training Act program which funds transportation jobs, including paratransit operators for social service programs. Coordination of programs and efficient use of Federal dollars for transportation cannot be achieved until all of this information is gathered and analyzed regularly as a cohesive unit.

The Federal government does not have a clear picture of how other levels of government aid transportation. In addition, the Federal government has limited data on the physical performance of the U.S. transportation system, so that it is impossible to determine whether Federal policies and programs are effective, or if more or less Federal spending is required to achieve Federal goals.

NOTES AND REFERENCES

1. For a complete listing of policies and programs, see U.S. National Transportation Policy Study Commission (NTPSC), *A Compendium of Federal Transportation Policies and Programs,* Report No. NTPSC/SR–78/06, Washington, D.C.: 1979. (Cited hereafter as NTPSC, *A Compendium.*) The report highlights potential problems with many of the programs. These problems were considered by the NTPSC in its research, and in formulating the policy recommendations given in Chapter 13.
2. U.S. General Accounting Office, *U.S. Transportation System—Federal Government's Role and Current Policy Issues,* Report No. RED–76–34, Washington, D.C.: 1975, p. i. (Cited hereafter as GAO, *U. S. Transportation System.*)
3. U. S. Office of Management and Budget, *The Budget of the United States Government—Fiscal Year 1979,* Washington, D.C.: 1978, p. 144.
4. See *Congressional Record,* 124 14 October 1978, p. H12933.
5. *Federal Maritime Commission v. Pacific Maritime Association,* 435 U.S. 40 (1978).
6. *Atchison, Topeka and Santa Fe Railway Co. v. Calloway,* 382 F. Supp. 610 (D.C.D.C., 1974).
7. *Complete Auto Transit v. Brady,* 430 U.S. 247 (1977).
8. *Michelin Tire Co. v. Wages, Tax Commissioner,* 423 U.S. 276 (1977).
9. *National Highway Traffic Safety Administration v. The Paccar, Inc.,* 573 F. 2d 632 (9th Cir. 1978), cert. denied, 99 S. Ct. 184 (1978).
10. For a more complete listing of intercity transportation policies and programs, see NTPSC, *A Compendium,* Appendix C.
11. Airline Deregulation Act of 1978, 49 U.S.C. Section 1371(d)(1979).
12. Interstate Commerce Act (IC Act), Parts I–IV, 49 U.S.C. Section 10101 *et seq.* (1978). The ICC, on its own initiative, has acted to shift the burden of proof in motor carrier entry proceedings to those protesting. See: Ex Parte 55, Sub. No. 26, *Protest Standards in Motor Carrier Application Proceedings* (reported in *Traffic World 177,* 5 March 1979, p. 113) and *Liberty Trucking Co.-Ext. Gen. Com.,* 130 MCC 243 (6 October 1978).
13. Department of Energy Act of 1977, as amended, 42 U.S.C. Section 7171 (1978).
14. Airline Deregulation Act of 1978, 49 U.S.C. Section 1371 (1978).
15. IC Act Section 203(b)(7a), 49 U.S.C. Section 10526(a)(5) (1978).
16. IC Act Section 203(b)(7a), 49 U.S.C. Section 10536(a)(1978).
17. IC Act Section 303, 49 U.S.C. Section 10542 (1978).
18. IC Act Section 1(18), as amended; Railroad Revitalization and Regulatory Reform Act of 1976, 49 U.S.C. Section 10901 (1978).
19. See, for example: *Texas and Pacific Railroad v. Gulf Railroad,* 270 U.S. 266 (1926).

20. Contract carriers may deal only with a limited number of firms, IC Act Section 203(a)(15), 49 U.S.C. Section 10102(12)(1978).
21. IC Act Section 203(c), 49 U.S.C. Section 10524 (1978).
22. IC Act Section 1(8), 49 U.S.C. Section 10746 (1978).
23. IC Act Section 203(a)(15), 49 U.S.C. Section 10102(12) (1978); Ex Parte No. MC–3101 Sub. No. 4, "Shaum Transfer Co.—Extension" (1978); Ex Parte No. MC-119 (1979).
24. The carriers themselves sometimes seek quite limited operating authority.
25. Ex Parte No. MC–119 (1979). A gateway can be understood by way of example: If a motor carrier has a certificate to provide service between St. Louis and Kansas City, and a certificate to provide service between Kansas City and Minneapolis, but no certificate to provide direct service between St. Louis and Minneapolis, then Kansas City would become the carrier's gateway to providing service between St. Louis and Minneapolis.
26. Ex Parte No. MC–55 (Sub. No. 28) (1978).
27. William McWorkman, Director of Logistics Systems, U.S. Postal Service, Washington, D.C., interview, March 1978.
28. IC Act Section 1(18), 49 U.S.C. Section 10903 (1978); Ex Parte No. 374 (Sub. No. 2) (1978).
29. Amtrak Improvement Act of 1975, 45 U.S.C. Section 564c (1978).
30. Department of Energy Docket No. CP–77–83 (1978).
31. IC Act Sections 216(a) and (b), 218(a), 49 U.S.C. Sections 10701, 10702 (1978).
32. IC Act Section 22, 49 U.S.C. Section 10721 (1978).
33. Dudley F. Pegrum, *Transportation: Economics and Public Policy,* 3rd edition, Homewood, Illinois: Richard D. Irwin, Inc., 1973, pp. 234–235. Such bureaus incorporate involvement in their activities on the part of shippers and shippers' organizations as well as carriers.
34. *Traffic World* 175 (25 September 1978), p. 11.
35. *Traffic World* 177 (26 February 1979), p. 1.
36. DOJ release, 21 July 1977.
37. *Wall Street Journal,* 5 December 1977.
38. Rail Passenger Service Act of 1970, as amended, 45 U.S.C. Section 501 *et seq.* (1978). See U.S. National Transportation Policy Study Commission, *Amtrak: An Experiment in Rail Service,* Report No. NTPSC/SR–78/02, prepared by Frank P. Mulvey, Washington, D.C.: 1978. But the ICC does become involved in disputes arising between Amtrak and the railroads that provide Amtrak with facilities and services.
39. Ex Parte No. 252 (Sub. No. 2) (1977).
40. *Coal from Kentucky, Virginia, and West Virginia to Virginia,* 308 ICC 99 (1959); *Coal to New York Harbor Area,* 311 ICC 355 (1960).
41. In November, 1978. See: Ex Parte No. 358–F, *Change of Policy Railroad Contract Rates* (General Policy Statement), (1978); *Traffic World,* 176 (20 November 1978), pp. 46–48.
42. The Railroad Revitalization and Regulatory Reform Act of 1976, 49 U.S.C. Section 1(5), amended the Interstate Commerce Act to provide new standards for determining the justness and reasonableness of rates subject to ICC regulation. Under the new section, no rate may be found to be too low if it contributes to the going concern value of the proponent carrier, and a rate which equaled or exceeded variable costs, as defined by the ICC, was presumed to contribute to going concern value.
43. U. S. Congress, House, Committee on Interstate and Foreign Commerce, *Conference Report on the Railroad Revitalization and Regulatory Reform Act of 1975,* H. Rept. 94–768 to accompany S. 2718, 94th Cong., 1st sess., Washington, D.C.; U.S. Congress, Senate, Committee on Commerce, *Conference Report on the Railroad Revitalization and Regulatory Reform Act of 1975,* S. Rept. 94–585 to Accompany S. 2718, 94th Cong., 1st sess., Washington, D.C.: Government Printing Office, 1975, p. 120.
44. Airline Deregulation Act of 1978, Section 418, 49 U. S. C. Section 1482 (1979), Pub. L. 95–504, and CAB ER–1080, Docket 33093(1978).
45. 49 U.S.C. Sections 1373, 1376, 1482 (1970).
46. Airline Deregulation Act of 1978, 49 U. S. C. Section 1551 (1979), Pub. L. 95–504.
47. 14 C.F.R. 399.92 (1978).
48. Executive Order 12009, 15 September 1977.
49. 49 U.S.C. Sections 304(a), (b), 1655(e), (f) (1970).
50. U.S. Department of Energy, *Energy Emergency Planning Guide, Winter (1977–1978),* prepared by Interagency Task Force for Winter Emergency Planning, Washington, D.C.: 1977.
51. Rail Passenger Service Act of 1970, as amended, 45 U.S.C. Section 501 *et seq.* (1978); Rail Transportation Improvement Act of 1976, as amended, 45 U.S.C. Section 601(a), (1978).
52. Rail Passenger Service Act of 1970, as amended, 45 U.S.C. Section 501 *et seq.* (1978); Amtrak Improvement Act of 1974, as amended, 45 U.S.C. Section 563 (1978); Rail Transportation Improvement Act of 1975, as amended, 45 U.S.C. Section 563 (1978).
53. 49 U.S.C. Section 1301 (1970).
54. Airline Deregulation Act of 1978, as amended, 49 U.S.C. Section 1376(b) (1970); Surface Transportation Assistance Act of 1978, as amended, 49 U.S.C. Section 1618 (1970).
55. The Highway Revenue Act of 1978, Pub. L. 95–599, Section 503, extended the Highway Trust Fund through FY 1985. The Energy Tax Act of 1978 (Title II, Pub. L. 95–618) eliminated the Federal excise taxes levied on intercity bus fuel, parts, tires, and equipment.
56. 23 U.S.C. Sections 129, 301 (1978).
57. 33 U.S.C. Section 988 (1970); 33 CFR 401.75 (1978).
58. Federal-Aid Highway Act of 1973, as amended, 23 U.S.C. Section 130 (1978).
59. 33 U.S.C. Section 401 (1970).
60. It should be noted that the Corps' projects are multi-purpose; only a portion of Federal water resource expenditures is attributable to waterway transportation. See, for example, U.S. Congressional Budget Office, *Financing Waterway Development: The User Charge Debate,* Washington, D.C.: Government Printing Office, 1977, p. 21.
61. Inland Waterways Revenue Act of 1978, as amended, 26 U.S.C. Sections 4041, 4042 (1970).
62. Statement of Deputy Attorney General, Antitrust Division, 1977. See: Jonathan C. Rose, "Surface Transportation and the Antitrust Laws," *ICC Practitioners Journal* 44 (May–June 1978), pp. 431–438.
63. AR 55–355. As of January 1, 1979 there were 2,830 cars in the fleet. Defense Freight Railway Interchange Fleet cars are lent to other Federal agencies on a non-reimbursable basis when not required for DOD use. Cars are leased to private shippers only when they are not required by other government agencies and the shipper has shown that he cannot obtain the necessary cars from the commercial sector. The cars are then leased to private shippers at competitive rates and made subject to immediate recall. James S. Matteson, staff, Rail Fleet Branch, Inland Traffic Directorate, Military Traffic Management Command, Department of Defense, telephone communication with NTPSC on February 1, 1979.
64. U.S. Army Corps of Engineers, "Summary of Activities, Corps & Industry, Dollars & Yardage," 19 September 1978.
65. 38 Stat. 305.
66. *Traffic World* 173 (13 March 1978), pp. 30–31.
67. U.S. Federal Railroad Administration, *Rail Planning Manual,* 5 volumes, prepared by JWK International Corp. and Roger Creighton Assoc., Washington, D.C.: 1976.
68. 49 U.S.C. Section 1701 (1970).
69. *Ibid.*
70. 49 U.S.C. Section 1713 (1970).

71. Rail Passenger Service Act of 1970, as amended, 45 U.S.C. (1970), as amended.
72. ICC No. 36312, 28 December 1977.
73. DOJ release, 21 July 1977.
74. U.S. Constitution, Article I, Section 8.
75. For a more complete listing of Federal urban transport policies and programs, see NTPSC, *A Compendium,* Appendix C.
76. *Short Haul Survival Committee v. United States,* 572 F.2d 240 (9th Cir., 1978), *aff'g* Ex Parte No. MC–37 (Sub. No. 26), Commercial Zones and Terminal Areas, 122 M.C.C. 422 (1976).
77. Federal-Aid Highway Act of 1973, 49 U.S.C. Section 1692a (1976).
78. 49 U.S.C. Section 1612 (1970).
79. 49 U.S.C. Section 1604(m) (1970).
80. 49 U.S.C. Section 1612 (1970).
81. See, for example, U.S. Representative Robert W. Edgar, "Must Transit Trip the Disabled?" in *Passenger Transport,* 36, September 1, 1978, p. 2. For an opposing viewpoint, see: Council on Wage and Price Stabilization, "Department of Transportation's Proposed Regulations on Nondiscrimination on the Basis of Handicap," Washington, D.C.: 20 October 1978, p. 22.
82. Rehabilitation Act of 1973, as amended, 29 U.S.C. Section 794 (1970).
83. 49 C.F.R. 27 (1978).
84. American Public Transit Association, Memorandum to the Department of Health, Education and Welfare, Office of Civil Rights, Washington, D.C. regarding *Proposed Rule Concerning Coordination of Federal Agency Enforcement of Section 504 of the Rehabilitation Act of 1973,* January 1978, p. 8.
85. 49 U.S.C. Section 1609(c)(1970).
86. 42 U.S.C. Section 185 *et seq.* (1970).
87. 23 C.F.R. 6581 (1978).
88. *Wall Street Journal,* 21 April 1978.
89. Energy Policy and Conservation Act of 1975, as amended, 42 U.S.C. Section 6295 (1970).
90. Noise Control Act of 1972, 42 U.S.C. Sections 4901–4906 (1977).
91. *Wall Street Journal,* 16 March 1978.
92. *Chicago Transit Authority v. Flohr et al.,* 570 F. 2d 1305 (7th Cir., 1977).
93. Federal Railroad Safety Act of 1970, as amended, 49 U.S.C. Section 1604(a)(1970).
94. 15 U.S.C. Section 2056 (1970).
95. 49 C.F.R. 177 (1978).
96. 23 U.S.C. Sections 103, 104 (1970).
97. See letter of 18 December 1978 from U.S. DOT Secretary Brock Adams to Representative Glenn Anderson illustrating the situation: "The number of FAUS grants for mass transit purposes is somewhat lower than anticipated. Transportation projects are prioritized by local elected officials in the Transportation Improvement Plan (TIP) and most cities have chosen to use their FAUS funds for highway projects and utilize UMTA Section 3 discretionary funds for transit projects. However, we believe that as the country becomes more environmentally and energy conscious and as demand for transit projects exceeds available UMTA funds, increased usage of FAUS funds will result. New York City, Chicago, Philadelphia and other major cities have actively used FAUS funds for transit, and are increasing their use."
98. Federal-Aid Highway Act of 1973, 23 U.S.C. Section 402(c)(1978).
99. Surface Transportation Assistance Act of 1978, 23 U.S.C. Section 146 (1978).
100. *Ibid.,* 23 U.S.C. Sections 146, 217 (1978).
101. Federal-Aid Highway Act of 1976, 23 U.S.C. Section 103(c)(4) (1978).
102. 49 U.S.C. Section 1602 (1970).
103. Surface Transportation Assistance Act of 1978, 49 U.S.C. Section 1602 (1978).
104. 49 U.S.C. Section 1604 (1970).
105. *Ibid.*
106. Surface Transportation Assistance Act of 1978, 49 U.S.C. Section 1614 (1978).
107. The 4R Act (Pub. L. 94–240 (1976)) began the program which became Section 17 of the UMT Act (49 U.S.C. Section 1613 (1977)). In 1977 Congress created Section 18 of the UMT Act (49 U.S.C. Section 1614 (1977)) to fund operating losses of commuter rail services outside the Northeast, while establishing the matching ratio of both Sections 17 and 18 at 80% Federal, 20% non-Federal. In 1978 Congress abolished Sections 17 and 18 in favor of including commuter rail assistance under Section 5 of the UMT Act (49 U.S.C. Section 1604, as amended by Pub. L. 95–599).
108. 23 U.S.C. Section 105(e)(1970).
109. Pub. L. 89–774, 80 Stat. 1324 (1967). The planned system is now 100 miles, although the lack of non-Federal sources of funding may preclude its full development.
110. U.S. General Accounting Office, *Hindrances to Coordinating Transportation of People Participating in Federally Funded Grant Programs,* CED–77–119, Washington, D.C.: pp. 1, 8–10 (Cited hereafter as *GAO, Hindrances.*)
111. 31 U.S.C. Sections 1221–1263 (1970).
112. Housing and Community Development Act of 1974, as amended, 42 U.S.C. Section 5301 *et seq.* (1970).
113. Jerry D. Ward and Norman G. Paulhus, *Suburbanization and Its Implications for Urban Transportation Systems,* prepared for the U.S. Department of Transportation, Washington, D.C.: 1974.
114. See David W. Harvey, "The Political Economy of Urbanization in Advanced Capitalist Societies: The Case of the United States," in *The Social Economy of Cities,* edited by Gary Gappert and Harold M. Rose, Beverly Hills, Calif.: Sage Publications, 1975, pp. 119–163; Michael A. Kemp and Melvyn D. Cheslow, "Transportation", in *The Urban Predicament,* edited by William Gorham and Nathan Glazer, Washington, D.C.: The Urban Institute, 1976, pp. 281–356; and Rolf R. Schmitt, "Predicting the Impacts of Transportation on the Spread of Urban Blight", in *Transportation Research Record* 634 (1978), pp. 27–32.
115. Richard F. Muth, "Urban Residential Land and Housing Markets," in *Issues in Urban Economics,* edited by Harvey S. Perloff and Lowdon Wingo, Jr., for Resources for the Future, Baltimore: Johns Hopkins Press, 1978, p. 302. See also Richard Goode, "Imputed Rent of Owner-Occupied Dwellings under the Income Tax," in *Journal of Finance* 15 (December 1960), pp. 504–30.
116. Revenue Act of 1978, 26 U.S.C. Section 164 (1978).
117. U.S. Urban Mass Transportation Administration, *Symposium Proceedings on Community Development and Passenger Transportation,* held November 8–9, 1977, Report No. UMTA-DC-06-0106-78-1, Washington, D.C.: 1978, pp. 15–174.
118. 42 U.S.C. Section 3121 (1970).
119. Statement of President Jimmy Carter on urban policy, March 27, 1978.
120. *Federal Register,* 22 September 1976.
121. 16 U.S.C. Section 3 (1970).
122. 42 U.S.C. Section 2790 (1970).
123. A survey in 1977 by the Southern California Association of Governments resulted in identifying over 862 providers of transit and paratransit services in Los Angeles County alone. Funding sources ranged from individual donations to Federal, state, and local government grants and subsidies. See Marilyn Westfall and Jenifer Vargas, *Inventory of Paratransit Services, Vol. I: Analysis of Survey Results,* Los An-

geles, California: Southern California Association of Governments, 1978.

124. 49 U.S.C. Section 1602 (1971).
125. 23 U.S.C. Section 134 (1970).
126. 23 U.S.C. Section 142 (1970).
127. 49 U.S.C. Section 1604 (1970).
128. 13 U.S.C. Sections 4, 6, 8 (1970).
129. 15 U.S.C. Sections 1151–1157 (1970).
130. 49 U.S.C. Sections 1602, 1604 (1970).
131. GAO, *Hindrances.*
132. IC Act, Section 203(b), 49 U.S.C. Section 10526 (a)(5)(1978).
133. *Agricultural Transportation Alliance v. ICC et al.*, U.S. Court of Appeals for the District of Columbia, Civil Action No. 78–1196, dated March 1, 1978, and others consolidated therewith.
134. IC Act Section 203(c), 49 U.S.C. Section 1092 (1978).
135. It should be recognized that certificated motor carriers may also trip lease to other certificated motor carriers. Moreover, certificated carriers may also return empty on the back-haul if traffic is insufficient.
136. Clayton Act, Section 1, 15 U.S.C. Section 12 *et seq.* (1973).
137. *Ibid.*
138. Ex Parte No. 374 (Sub. No. 2), *Abandonment of Railroad Lines and Discontinuance of Service* (1978).
139. IC Act Sections 212(a), 204(a)(1), 49 U.S.C. Sections 10925, 11101 (1978). For a recent discussion of this issue, see: U.S. Congress, Senate, Committee on Commerce, Science and Technology, *The Impact on Small Communities of Motor Carriage Regulatory Revision,* 95th Cong., 2d sess., Washington, D.C.: Government Printing Office, 1978.
140. 14 C.F.R. 298 (1978).
141. Airline Deregulation Act of 1978, 49 U.S.C. Section 1386 (1978).
142. Boundary Waters and Canoe Area Act of 1978, 16 U.S.C. Sections 1132, 1133 (1978).
143. 49 U.S.C. Section 1603 (1970).
144. *Ibid.*
145. Surface Transportation Assistance Act of 1978, 49 U.S.C. Section 1614 (1978).
146. *Ibid.*
147. Surface Transportation Assistance Act of 1978, as amended, 49 U.S.C. Section 1611 (1978).
148. 42 U.S.C. Sections 3021–3025 (1970).
149. The Governor's Committee on Rural Public Transportation, *Final Recommendations: Transportation Options for Rural and Small Community Populations in North Carolina,* Raleigh, North Carolina: December 1978, pp. 5–6.
150. 23 U.S.C. Section 144 (1970).
151. Surface Transportation Assistance Act of 1978, 23 U.S.C. Section 101 *et seq.* (1978).
152. Railroad Revitalization and Regulatory Reform Act of 1976, as amended, 49 U.S.C. Section 1654 (1970).
153. Surface Transportation Assistance Act of 1978, 23 U.S.C. Section 130 (1978).
154. Local Rail Service Assistance Act of 1978, as amended, 49 U.S.C. Section 1654(g) (1970).
155. 23 U.S.C. Section 148 (1970).
156. 16 U.S.C. Sections 532–538 (1970).
157. *Ibid.*
158. 40 App. U.S.C. Section 201 (1970).
159. 16 U.S.C. Sections 4606–4612 (1970).
160. 31 U.S.C. Sections 1221–1263 (1970).
161. GAO, *U.S. Transportation System,* p. 67.
162. "White House Rural Transportation Initiatives," Remarks of Dr. Berry Crawford, Office of Intergovernmental Affairs, Executive Office of the President, at Session 71, "Rural Public Transportation," Transportation Research Board 58th Annual Meeting, Shoreham-Americana Hotel, Washington, D.C.: 1979.
163. 38 Stat. 305.
164. 23 U.S.C. Section 218 (1970).
165. An Act to Establish a Rural Transportation Advisory Board, 49 U.S.C. Section 1653 (1978).
166. NCHRP Project 20–17.
167. 49 U.S.C. Section 1603(c)(1970).
168. Federal-Aid Highway Act of 1973, 23 U.S.C. Section 142 (1978).
169. U.S. Bureau of the Census, *1970 Census Users' Guide,* Washington, D.C.: Government Printing Office, 1970, p. 82.
170. Detailed Census tract statistics from the 1970 Census are published for 241 SMSAs. The average tract has about 4,000 residents. See U.S. Bureau of the Census, *Census Tract Manual,* 5th Edition, Washington, D.C.: Government Printing Office, 1966.
171. 46 U.S.C. Sections 914, 817 (1970).
172. Merchant Marine Act of 1936, 46 U.S.C. Section 1111 *et seq.* (1970).
173. 46 U.S.C. Sections 816, 817 (1970).
174. Harbridge House, Inc., *The U.S. Merchant Marine and the International Conference System,* prepared for MarAd, Washington, D.C.: August 1978, p. I–2.
175. Irwin M. Heine, *The United States Merchant Marine: A National Asset,* Washington, D.C.: National Maritime Council, July 1976, p. 51.
176. Airline Deregulation Act of 1978, 49 U.S.C. Section 1371 (1978).
177. 49 U.S.C. Section 1461(a) (1970).
178. Airline Deregulation Act of 1978, 49 U.S.C. Section 1461 (1978).
179. 49 U.S.C. Sections 1373, 1376, 1482 (1970).
180. *Traffic World* 176 (25 December 1978), p. 82.
181. 46 U.S.C. Sections 820, 841 (1970).
182. 19 U.S.C. Sections 160, 1337, 2251–2253 (1970).
183. 19 U.S.C. Sections 2271–2322 (1970).
184. 49 U.S.C. Sections 1301, 1431(6)(1) (1970); 49 U.S.C. Section 361 *et seq.* (1970).
185. 33 U.S.C. Sections 157, 243, 353, 1221 (1970); 46 U.S.C. Sections 375, 416, 526 (1970).
186. *Traffic World* 174 (1 May 1978), p. 21.
187. 49 U.S.C. Section 1151 *et seq.* (1978).
188. 46 U.S.C. Section 1271 (1978).
189. Merchant Marine Act of 1970, Pub. L. 91–469, 84 Stat. 1018, amending the Merchant Marine Act of 1936, 46 U.S.C. Section 1101 *et seq.* (1970).
190. 46 U.S.C. Sections 1114–1161 (1978).
191. 46 U.S.C. Section 1171 (1978).
192. 46 U.S.C. Section 1114 (1978).
193. J. David Richardson, "The Subsidy Aspects of a 'Buy American' Policy in Government Purchasing," in U.S. Congress, Joint Economic Committee, *The Economics of Federal Subsidy Programs, A Compendium of Papers, Part 2 International Subsidies,* Joint Committee Print, 92d Cong., 2d sess., Washington, D.C.: Government Printing Office, 1972.
194. 46 U.S.C. Sections 861 and 877 (1970).
195. Airline Deregulation Act of 1978, as amended, 49 U.S.C. 1324 (1978).
196. International Air Transportation Fair Competitive Practices Act of 1974, as amended, 49 U.S.C. Section 1159 (1978).
197. 12 U.S.C. Section 635 (1978).
198. *Wall Street Journal,* 14 April 1978.
199. Department of Defense, Communication to NTPSC, 19 January 1978.
200. 10 U.S.C. Section 2304 (1978).
201. 49 U.S.C. Section 1301 *et seq.* (1970).
202. 49 U.S.C. Section 1301 (1970).
203. 49 U.S.C. Section 1713 (1970).
204. 49 U.S.C. Section 1701 (1970).

205. While the balance has grown in recent years (from airline ticket taxes and other user fees), the trust fund is not used to cover operating expenses of the FAA, which operates the U.S. air traffic control system.
206. *The Washington Post,* 30 March 1978.
207. John L. Hazard, "National and State Roles in Port Development," in U.S. National Transportation Policy Study Commission, *Papers on Selected Transport Policies of Developed Countries,* NTPSC Special Report No. 5, Washington, D.C.: (forthcoming).
208. 42 U.S.C. Section 3121 (1970).
209. 33 U.S.C. Sections 1221–1227 (1970).
210. 16 U.S.C. Section 4606 (1970).
211. 16 U.S.C. Section 1432 *et seq.* (1970).
212. 16 U.S.C. Section 460 (1970).
213. *Journal of Commerce,* 30 August 1978; *Handling and Shipping,* 19 April 1978, p. 14.
214. Steven G. Pilla, Office of Maritime Affairs, U.S. Department of State, Correspondence, 17 January 1978.
215. Some lack of uniformity occurs as a result of different and more favorable matching ratios in states where larger Federal land-holdings exist.
216. *Chicago Transit Authority v. Flohr et al.,* 570 F.2d 1305 (7th Cir., 1977).

State and Local Transportation Policies and Programs

3

INTRODUCTION

This chapter discusses transportation at state and local levels from an intergovernmental perspective. It is at the state and local levels of government that many national policies are carried out; therefore, national policies must take state and local concerns and interrelationships between governments into account. The chapter discusses: government institutions which are responsible for the creation of policy and its implementation; programs of Federal aid in which state and local governments participate; state and local transport issues as expressed by interest groups and witnesses at NTPSC hearings; and gaps and conflicts apparent in the policies and programs administered by Federal, state, and local governments.

BACKGROUND OF INTERGOVERNMENTAL RELATIONS

Government at every level establishes policies, programs and regulations that affect transportation, but states and localities are the primary implementors of public transportation projects.[1] The functions performed by each government are not always separate and distinct, nor are they always compatible. While the goals of all may be the provision of efficient and ubiquitous transportation for persons and freight, each government responds to a different set of priorities, for a different constituency, and under different and changing conditions.

Over the years, state and local governments have come to demand greater Federal participation to help defray public transportation costs.[2] The latter has responded with an array of grants and programs that vary in scope, funding level and requirement. Increasing Federal involvement can have adverse effects because of diverse goals; state and local governments may find themselves carrying out various national objectives which may or may not parallel their own.[3]

A complicating factor in relationships among levels of government is the array of government, quasi-government, and special bodies which exist to plan, regulate, fund and coordinate transport services. Although ultimate authority regarding transportation services and facilities usually lies with state and local governments, multistate regional bodies, substate districts, and transportation authorities all influence decisionmaking, and many of these are created or perpetuated by the Federal government.

In 1913, the percent of local public expenditures from local sources in the U.S. was 58 percent, while the Federal government accounted for 30 percent and state governments contributed 12 percent. By 1975, the relative shares had shifted dramatically; the Federal share of local public expenditures rose to 61 percent, the state level reached 22 percent, while the local share decreased to 17 percent.[4] Shifts in relative shares for transportation expenditures are more difficult to determine, except in the case of highways, where states have provided an appreciably greater share all along.[5]

PHASES IN INTERGOVERNMENTAL RELATIONS

In the past century, intergovernmental relations passed through distinctive phases. From the 19th century until the 1930s, dominant policy issues in intergovernmental relations involved identifying and demarcating spheres of government power and jurisdiction. Local governments searched for the exact limits of their legal powers, while the states sought to assert their supremacy over local governments through the courts. The administration and financing of roads, for example, which had traditionally concerned only local governments, became a policy area of considerable importance to state governments as well.[6] Because state regulation was struck down by the Supreme Court, Federal regulation of railroad rates was established through the ICC in 1887.[7]

Federal-state cooperation in highway policy began in 1916.[8] A significant policy innovation, the formula-based grant-in-aid, institutionalized a pattern of fiscal and administrative relations between the Federal government and the states.[9]

After World War II, intergovernmental relations were influenced by a growing suburban population and demands for deferred public projects. The number of grant-in-aid programs doubled from the Depression years.[10] Through the 1956 Federal-Aid Highway Act and the Highway Revenue Act of 1956, user fees were increased and placed in a trust fund to build a national system of Interstate and Defense Highways.[11]

The Great Society programs of the1960s had the effect of increasing Federal-local interactions.[12] Program planning in transportation was reinforced and expanded in the Federal-Aid Highway Act of 1962, with its 3C requirements,[13] following the local urban planning requirements of the National Housing Act of 1954,[14] which led to the expansion of transportation planning activities. In 1964, the Urban Mass Transportation Act was passed.[15]

After creation of the U.S. DOT in 1966,[16] most major modal transportation agencies in the Federal government were assembled in one cabinet-level agency. Similar organizational changes ensued at the state level, with the development of a number of multimodal state DOTs.

In the 1970s, intergovernmental relations were characterized by Federal involvement in transportation at the state and local levels through new Federal programs for airport development, railroad continuation and revitalization, and mass transit operating subsidy. Federal activities have channeled or stimulated financial commitment and program development by state and local government.

The expansion of Federal grant programs in transportation, with the continuation of traditional programs, led to a bewildering array of grant categories, with various formulas and matching ratios. State and local government officials testifying at NTPSC hearings view today's situation as overemphasizing Federal priorities at the expense of their own, and believe that excessive demands on their finances are caused by pressures to respond to Federal grant opportunities.

INSTITUTIONAL FRAMEWORK

The following section describes state and local institutions important to transportation. Some of the institutions examined are neither state nor local governments, but impact transportation within those jurisdictions.

STATE INSTITUTIONS

State institutions active in transportation include governors' offices, state transportation agencies, and state legislatures. Usually non-transportation agencies, such as a state environmental protection agency, a public utility or public service commission (PUC/PSC) and, in some cases, special modal regulatory authorities, regulate transport activities.

Major transportation functions of states are planning and programming, funding, construction, operation and maintenance, and regulation. Since the turn of the century, a primary state duty has been the construction, maintenance, and operation of transportation facilities, particularly highways.

The level and type of state involvement in transportation varies with the urbanization of the state, its geographic location, and a number of other variables, including interrelations between the governor's office and the state legislature. In the example of the federally funded West Virginia TRIP demonstration program, which offers discount transportation coupons to elderly, handicapped and low-income residents, success of the program varied with the political climate. It was favorably received in 1974 as a program of the West Virginia Department of Welfare. After a change in state administration, responsibility for different segments of the program was divided between the state welfare department and the newly created Office of Economic and Community Development in the governor's office. By 1977, state and Federal support for the program appeared to be faltering, and in 1978 it operated under the auspices of the state highway department. For 1979, West Virginia anticipates a decreased program.[17]

Typically until the 1960s, state modal agencies planned for transportation and implemented projects individually, undertaking little or no coordination with other modal or regulatory agencies. Most planning was undertaken in compliance with Federal requirements, which at that time did not emphasize coordination.[18]

Many factors contributed to the states' forming multimodal transportation agencies, including establishment of the U.S. DOT, and enactment of the Federal-Aid Highway Act of 1962.[19] Another stimulus may have been the Federal-Aid Highway Act of 1970, requiring action plans considering both environmental factors and the impact of highways on other modes.[20] The Airport and Airways Development Act of 1970, the Regional Rail Reorganization Act (3R Act) of 1973, and the Railroad Revitalization and Regulatory Reform Act of 1976 (4R Act) also call for the development of statewide plans, requiring integration with plans for other modes.[21] Finally, the National Transportation Reports of 1972 and 1974 provided impetus to extending modal planning.[22]

Federal incentives aside, states have also reorganized their governments independently, with the formation of a state DOT as one of the products. According to the Advisory Commission on Intergovernmental Relations, these state departments may have resulted from the states' desire to coordinate their own planning efforts more efficiently, in order to achieve a balanced transportation system.[23] However, it is likely that other factors may have been important, including

> . . . revenue shortfalls for a particular mode, the energy crisis, environmental and social concerns, general government reorganization and consolidation, and Federal regulations.[24]

As of 1977, 38 states had such departments, ostensibly with the goal of providing a multimodal system. However, a number of these organizations remain dominated by one or two modes, usually the highway agency; in fact, of the 38 state DOTs in1979, 5 still have the word "highway" in the title of the transportation agency. (See Table 6.)

As part of the NTPSC's research, a survey was conducted of the enabling legislation for 28 state DOTs, revealing that virtually all those states transferred the powers and duties of the state highway department to the DOT. Some also transferred the transportation segment of the PUC/PSC to the DOT. Most of the 28 states transferred aviation agencies, rail authorities and departments of motor vehicles; some transferred agencies dealing with a specific facility, such as the Kansas Turnpike Authority, or service, such as the Wisconsin State Patrol.

The structure of a DOT does not necessarily presage the range of the activities in which it may become involved, nor the extent of the involvement. (The range of state DOT functions as of 1979 is shown in Table 7.) Vermont, for example, which has a multimodal department with responsibility for aeronautics, highways, motor vehicles, buses, rail, waterways and motor carrier services, currently conducts no long-range planning.[25] Utah's state legislature established a DOT ". . . to provide balanced and coordinated transportation systems,"[26] but the department plans separately for each mode. State DOTs generally have constrained budgeting functions, because funds are allocated along modal lines, with no provision for:

> . . . intermodal funding flexibility. This is a liability for most state DOTs since it can prevent the realization of the DOT's potential for intermodal planning and policymaking.[27]

There are quite interesting relationships between state DOTs and state regulatory agencies. In some instances, as with rail abandonments, the PUC/PSC's functions may overlap those of the transport agency. It is not uncommon for a state transportation agency, PUC/PSC, Attorney General's Office, and the Federal government to be involved simultaneously in a particular abandonment.

TABLE 6. State departments of transportation and multimodal agencies, 1979 [a]

State	Year Effective	Title
Alaska	1977	Department of Transportation and Public Facilities
Arizona	1974	Department of Transportation
Arkansas	1977	State Highway and Transportation Department
California	1973	Department of Transportation
Connecticut	1969	State Department of Transportation
Delaware	1968	Department of Highways and Transportation
District of Columbia	1975	Department of Transportation
Florida	1967	Department of Transportation
Georgia	1972	Department of Transportation
Hawaii	1960	Department of Transportation
Idaho	1974	Transportation Department
Illinois	1972	Department of Transportation
Iowa	1974	Department of Transportation
Kansas	1975	Department of Transportation
Kentucky	1973	Department of Transportation
Louisiana	1977	Department of Transportation and Development
Maine	1972	Department of Transportation
Maryland	1972	Department of Transportation
Massachusetts	1971	Executive Office of Transportation and Construction
Michigan	1978	Department of Transportation
Minnesota	1976	Department of Transportation
Missouri	1974	Department of Transportation
New Jersey	1967	State Department of Transportation
New Mexico	1978	Department of Transportation
New York	1967	State Department of Transportation
North Carolina	1971	Department of Transportation and Highway Safety
Ohio	1972	Department of Transportation
Oklahoma	1976	Department of Transportation
Oregon	1969	Department of Transportation
Pennsylvania	1970	Department of Transportation
Puerto Rico	1973	Department of Transportation and Public Works
Rhode Island	1970	Department of Transportation
South Dakota	1973	Department of Transportation
Tennessee	1972	Department of Transportation
Texas	1975	Department of Highways and Public Transportation
Utah	1975	Department of Transportation
Vermont	1975	Agency of Transportation
Virginia	1974	Department of Highways and Transportation
Washington	1977	Department of Transportation
Wisconsin	1967	Department of Transportation

SOURCE: Information provided by the U.S. Federal Highway Administration, Program Management Division, 7 September 1977 and the Iowa Department of Transportation, Division of Planning and Research, "State Departments of Transportation as of February 1979," Ames, Iowa.

[a] Includes the District of Columbia and Puerto Rico.

TABLE 7. State department of transportation functions, 1979

	Aeronautics	Highway	Rail	Waterways or Ports	Transit	Regulation	Highway Patrol	Motor Vehicle	Other
Alaska	X	X		X	X,T				Public Facil.
Arizona	X	X	P		P,T			X	
Arkansas	P	X	P	P	P	Weight			Toll Roads
California	X[a,c]	X,P,T	X[c],P,T		X[c],P	T	T		Toll Brgs.,Fer.
Connecticut	X	X	X	X	X				
Delaware	X	X	X		X				Toll Roads
Dist. of Columbia		X			T			X	
Florida	X	X	P,T	P	X				Toll Facil.
Georgia	X	X	P,T	X	X				Toll Roads
Hawaii	X	X	T	X	T	T	T	X	
Idaho	X	X	P		P,T	Wt./Size			Hwy. Safety
Illinois	X,T	X,T	X	P,T	X,T	T	T		Safety
Iowa	X	X	X	P,T	X,P,T	X		X	Toll Bridges
Kansas	T	X	P	P	X				
Kentucky	X	X	P	P	X,T	X		X	Toll Facil.
Louisiana	X	X	P		X	Weight			Toll Brgs.,Fer.
Maine	X	X	T	X,P	T				
Maryland	X,P	X,P,T	X,P,T	X,P	X,P,T			X	Toll Facil., Safety
Michigan	X	X	X	X,P,T	X				Toll Bridges
Minnesota	X	X	X	X	X	X			
Missouri	X		X	X	X				
New Jersey	P,T	X	X		X	In Process			
New Mexico	X				X	Enforcement		X	
New York	X,T	X,T	X,T	X,T	X,T	X			
North Carolina	X[c],P,T	X	P		X[c],P,T	Weight	X[e]	X	Ferries
Ohio	X	X	T	T	T	X			Toll Facil.
Oklahoma	P,T	X	P	P	P,T				
Oregon	X	X	P	P	X		X[e]	X	Parks
Pennsylvania	X,P,T	X,P,T	X,P	X	X,P,T	P,T	X	X	Toll Facil.
Puerto Rico	X	X		X	X	X		X	Toll Roads
Rhode Island	X	X	X[c]		X[c]	X		X	Hwy. & Safety
South Dakota	X	X	P		T	X[d]	X[e]		
Tennessee	X	X		X	X				
Texas		X		P	X[c],P,T			X	Ferries, Hwy. Safety
Utah	X	X	Safety		T	Motor Car.			
Vermont	X	X	X	X	X	X		X	
Virginia		X			X			X	Toll Roads
Washington	X	X	P		P,T	Weight			Toll Brgs.,Fer.
Wisconsin	X	X	X[c],P	P	X,T		X	X	Ferry

SOURCE: Adapted from Iowa Department of Transportation, Division of Planning and Research, "State Departments of Transportation, as of February, 1979," Ames, Iowa: 1979.

P Planning
T Technical Assistance
X Financial Control or Responsibility

[a] Capital improvements only

[b] Funding for commuter lines only

[c] Partial funding

[d] Highways and airports only, exclusive of motor vehicles

[e] From highway revenues; under Dept. of Public Safety

To counter conflict and combine like activities, some states have merged their PUC's transportation-related functions with the state DOT.

In the few states that have not reorganized, the predominant transport agency is the highway department, usually coupled with a division of motor vehicles. The highway department in such states is important because it ". . . is normally an independent agency, and typically includes over 90 percent of the state's transportation funds and personnel."[28] Usually in states without multimodal DOTs, an independent PUC/PSC regulates motor carriers and, sometimes, pipelines, rail, air and water transportation.

LOCAL INSTITUTIONS

Local governments are also responsible for transportation. Further, quasi-governmental bodies with regional responsibilities participate in planning and funding projects and, in some cases, in operating transport systems.

Cities

Cities have traditionally provided many transportation services, including: street construction, maintenance and repair; parking; water transport; airport access, maintenance and operation; and transit. (Some of these responsibilities may fall to special districts.) Cities have financed these services through general revenues and user fees. As mass transit problems increased, many local governments began to take over provision of urban transit services from the private sector. Publicly owned and operated transit became increasingly prevalent, and by 1977 such systems carried 91 percent of all revenue passengers, although only 45 percent of the nation's transit systems were publicly owned.[29] Cities also undertake certain planning functions.

Counties and Parishes

Both rural and urban counties and parishes have historically been involved in highway projects, with special districts or city governments usually providing other transportation functions. In recent years, counties and parishes have begun to assume certain other functions as well. A survey conducted in 1971 showed that one-third of all counties were then involved in the provision of airport services, and a smaller number participated in water transport, parking and transit.[30]

A county's size and geography bear directly on the type and extent of transport services it provides. Generally, the more urbanized a county, the more likely it is to plan and manage its own transportation system and have its own DOT. Highly urbanized Montgomery County, Maryland, has a DOT that engages in a whole range of transport activity, including long- and short-range planning, transit operation and the provision of various services. Montgomery County runs its own bus system (funded independently of the Federal government), which supplements the areawide Metrobus and Metrorail system.[31] Although responsibility to plan, construct and operate rural transportation facilities or services usually rests with either state or county government, rural counties have begun to assume more of these tasks themselves.[32]

Regional Bodies

Substate regional organizations increasingly plan and implement metropolitan transport projects.[33] Because they are quasi-governmental in nature (that is, with some of the responsibilities and powers normally vested in governments that provide transport services), their interactions with local governments may appear confusing. For example, regional bodies plan for and coordinate planning by local governments, but most have no implementation power. The Federal government has encouraged the development of such bodies for particular Federal programs. As a result, there has been a proliferation of these substate entities, many with overlapping responsibilities.

Three regional bodies affecting transportation are: regional planning commissions or agencies (RPCs or RPAs); councils of government (COGs); and metropolitan planning organizations (MPOs). Both RPCs and COGs came about following the 1954 Housing Act, and both proliferated in the late 1960s.[34] By and large, they provide comprehensive regional planning services involving land use and transportation. By contrast, MPOs resulted from both amended UMTA legislation and the 1973 Federal-Aid Highway Act, through which DOT asked each governor to appoint MPOs to receive and coordinate Federal funds and programs emanating from the FHWA, UMTA, and to the extent possible, FAA.[35] Other requirements affect the responsibilities of regional agencies. These include Office of Management and Budget (OMB) Circular A–95, which directs the governors to designate agencies, one at the state level and one for each metropolitan or non-metropolitan area, with area-wide review and clearinghouse powers.[36] Support for regional bodies was also provided through the National Environmental Policy Act of 1969.[37] In 1969, the Environmental Protection Agency (EPA) began requiring the preparation of environmental impact statements, which were then to be submitted for review by the designated A–95 agency. In June 1978, the U.S. DOT and EPA released a series of jointly developed guidelines designed to help urban areas meet established ambient air quality standards, with the goal of integrating air quality and transportation plans developed by MPOs or other agencies.[38]

In 1973, 17 additional Federal programs offered planning-related assistance to metropolitan organizations to meet Federal standards.[39] The same regional body does not necessarily coordinate all these Federal programs. It should also be emphasized that neither COGs, MPOs, or most RPCs have the power to raise revenues or implement plans.

Special Districts

Another form of substate body which can affect transportation is the special district. Special districts are incorporated through local initiative, with state authorization, to provide a particular service not being rendered by a state or local government to a given area. Districts usually have a single function and are administered by a board of directors that is either appointed or elected. Typical special districts provide soil conservation, cemetery, sewer, or transit services. Special districts may have taxing powers or may derive revenue from user charges, in order to defray costs. Public transit authorities are a major type of special district. These bodies typically depend on revenue from users as well as funds from Federal, state and local governments. In 1972, 93.9 percent of all transit special districts were located in Standard Metropolitan Statistical Areas (SMSAs).[40] A variation on the special district theme is provided by some port authorities, such as the Massachusetts Port Authority (Massport), which is responsible for more than one mode of transportation.[41]

MULTISTATE REGIONAL ORGANIZATIONS

Another form of regional organization bears mention: the multistate regional organization (MRO). As broadly defined, MROs may be created by interstate compacts, parallel state legislation, Federal and state legislation, or executive action.[42] MROs may be separate legal entities and sometimes possess substantial indigenous revenue-generating powers. They may depend on congressional or state appropriations, or both. Many bistate and multistate regional organizations construct and operate transportation facilities such as bridges, ferries and tunnels. Others perform planning and engage in intergovernmental coordination. Still others possess regulatory powers which may directly or tangentially affect transportation, particularly inland navigation and international maritime transportation. While most MROs have a transportation component, this is usually not their primary concern. Some bistate commissions, however, were formed specifically to deal with transportation problems. The Port Authority of New York and New Jersey, for example, constructs and operates many of the region's transportation facilities.

STATE AND LOCAL TRANSPORTATION PROGRAMS

A review of the transport activities carried out at state and local levels of government helps explain the policy priorities of those jurisdictions. This review proceeds by reference to functions performed by state and local institutions: planning; finance and operation; and regulation of transportation.

PLANNING

Multimodal transportation planning is a fairly recent function of the states. It generally has been undertaken by states on their own initiative, but certain mode-specific plans are produced to qualify for Federal aid. State and local governments have traditionally planned for highways and roads within their jurisdictions, and, except for Federal-aid highways, have done so with little Federal intervention.

For several decades prior to the 3R and the 4R Acts, the Railroad Passenger Service Act, and the Federal Railroad Safety Act, state and local governments did little in the rail sector.[43] Much of the planning that occurred concerned suburban rail passenger service, urban rail transit, or Amtrak.[44] The 3R Act established planning processes for reorganizing the systems of the 17-state Midwest and Northeast region in order to create financially viable rail services. The act established the Rail Services Planning Office (RSPO) in the ICC, with duties directly related to state rail planning. For example, the RSPO has assisted state, local and regional transportation authorities in determining whether particular rail properties are suitable for subsidy.[45]

Many local governments carry out planning functions through their community development departments; some, however, have a DOT. Typically, localities plan streets, roads and transit, and may undertake port and airport planning. Some states, though, carry out metropolitan transportation functions.[46] When a city does not have a DOT and does not come under state control for its local planning, a regional agency, a special district, or a transportation authority may do the planning.

State and local governments have undertaken planning to accommodate pedestrians and bicycles, both of which are subject to hazardous conflicts with motor vehicle traffic. Attempts by cities to create a more desirable walking environment include the provision of auto-free zones (in which buses may be permitted), and urban and suburban pedestrian shopping malls (frequently enclosed), which allow no vehicles. A number of states and the District of Columbia have produced plans for bicycle routes, which have been implemented to varying degrees.[47] Bicycles are often relegated to bike routes, much like bus routes. Some abandoned rail lines have been converted for use by bicycles.[48]

MPOs are responsible for the production of Transportation Improvement Plans (TIPs) and either the MPO or a local government may develop concomitant Transportation Systems Management (TSM) measures.[49] Typical TSM options—such as contraflow or priority bus lanes, parking restrictions, one-way streets and signalization—may be suggested by an MPO for local consideration. Conversely, local governments may design TSM plans appropriate to their unique needs and submit them to the MPO for regional review. In either case, the MPO is responsible for integrating a TSM element with the TIP.[50] Although TSM activities are eligible for general Federal transportation aid, no categorical funds are specifically allocated for TSM projects.[51]

The Federal government has often required planning as a condition for receipt of aid. However,

> . . . most "state plans" called for by the Federal grants are not plans in accepted parlance; instead, they are assurances of state intent to comply with federally prescribed program specifications.[52]

National planning efforts conducted by the Federal government may also be insensitive to the needs of states and localities. The FAA's National Airport System Plan has been criticized for several shortcomings.[53] State and local governments complain that the FAA does not integrate state airport system plans and airport master plans into its own planning.[54] Consequently, priorities for airport expenditures may not be reflected in federally determined grants for ADAP funds. A lack of airport system planning at all levels has also been criticized by those who argue that airports are not viewed as a system when financial "needs" for individual airports are determined, nor is there sufficient long-term planning of airport investment.[55]

FINANCE AND OPERATIONS

Funding transportation projects is a major state concern, and one which requires considerable intergovernmental activity. States may fund entire projects, as in the case of state highways, or they may provide financial aid to local governments, frequently on a matching basis with Federal funds.[56] Table 8 summarizes state transportation expenditures over three recent years.[57] In most states, highway expenditures predominate.

Airports

States and localities administer, promote and develop the nation's airports. As of January 1, 1977, there were 13,830 airports in the U.S. (including heliports, sea plane bases and STOL—short takeoff and landing—ports), about half of which were open to the public. Of those open to the public, 2,649 belonged to private operators and 4,265 were publicly owned.[58] Most publicly owned airports are operated by municipalities, counties, special authorities or airport districts, or states.

State expenditures on airports totaled over $350 million in 1976.[59] In that year, the largest U.S. cities that operate airports (including, among others, Chicago, Atlanta, Houston, Cleveland, Philadelphia and Los Angeles) also spent over $350 million.[60] This compares to Federal government expenditures of $290 million under airport development and planning grant programs for fiscal year 1976 plus the transitional quarter.[61] These figures indicate that over 70 percent of government expenditures on airports in the U.S. come from state and local sources.

All but five states fund airport development. State aviation programs may include: planning state airport systems; installing, operating, and maintaining navigation and landing aids; conducting aviation safety programs and providing aerospace education; and regulating intrastate air carriers. States have also assisted communities in obtaining and retaining scheduled air carrier service. States encourage airport development with grants or loans, and through the provision of technical and engineering assistance to local bodies responsible for airports.[62]

Airport policies of local governments are constrained by Federal and state laws governing air traffic control, safety, and air carrier rates and service. Federal and state laws determine how local governments may acquire, develop, finance, zone and operate airports. However, the local airport authority makes the decisions that affect the public most directly, because it must effect compromise between the needs of air travelers and shippers on the one hand and those of local residents on the other. An airport may become the focal point of controversy over such issues as runway extension, noise abatement, zoning, and the adequacy of terminal areas.[63]

Highways

Since colonial times, the primary responsibility for construction and maintenance of roads has shifted among the levels of government. The Federal government initially limited its participation in road building, but since the turn of this century, has steadily increased its aid to the states for highway construction. The role of local government has been largely to finance and construct facilities not part of the Federal-aid primary, secondary, or urban systems. Local governments generally maintain all except state or Federal roads, usually with a large

TABLE 8. Summary of transportation expenditures by state, FY 75–77 [a]

	Fiscal Year 1977						Fiscal Year 1976	
State	Highways	Public Transit	Air	Water	Other[c]	Total	Highways	Public Transit
Alabama							131,415,109	
Alaska	272,606,214		30,469,555	35,681,557		338,727,320	209,759,764	
Arizona	179,949,291	234,413	765,632		80,000	181,028,336	199,383,911	232,000
Arkansas								
California	1,044,970,605	4,500,000	2,400,000	247,900,000	68,901,225	1,368,671,830	963,551,237	3,000,000
Colorado	245,005,000	356,000			32,000	245,393,000	160,282,000	353,000
Connecticut								
Delaware							53,318,018	3,300,000
Florida							525,498,000	4,862,900
Georgia	397,840,801	537,162	271,012	250,000	571,217	399,470,197	429,431,614	633,984
Hawaii	90,800,000	33,140,000	80,978,000			204,919,000	111,700,000	27,418,000
Idaho	111,144,900	961,800	969,600			113,076,300	103,530,600	435,500
Illinois							1,939,099,900	253,032,200
Indiana	242,654,084					242,664,084	249,118,695	
Iowa	216,630,478	1,424,861	436,501	68,593	26,216,943	243,777,376	238,822,017	118,817
Kansas	224,786,196	2,157,983	25,613	6,108	65,366	227,041,266	234,648,358	2,043,063
Kentucky							421,380,170	550,000
Louisiana							489,173,284	
Maine							106,875,000	173,000
Maryland	374,052,000	108,226,042	29,883,546	34,058,768	136,649,836	828,869,992	380,093,983	90,081,734
Massachusetts							173,100,000	187,700,000
Michigan	431,500,000	44,100,000	13,100,000	3,150,000		493,850,000	416,100,000	30,100,000
Minnesota	305,047,596	13,581,500	10,200,481		5,343,082	334,172,659	294,074,716	15,413,700
Mississippi							312,682,000	
Missouri	437,914,623					437,914,623	446,968,679	
Montana	154,091,319	150,000	89,000			154,330,319	87,573,158	150,000
Nebraska	136,605,000	1,473,000	5,498,000			143,578,000	142,906,000	1,136,000
Nevada	73,322,771					73,322,771	70,863,028	
New Hampshire							97,595,919	
New Jersey	113,249,000	186,706,000	9,372,000		6,589,000	315,916,000	186,441,000	152,311,000
New Mexico	168,401,600	328,750				168,730,350	141,833,030	464,570
New York	555,000,000	119,700,000	600,000	10,500,000	112,600,000	798,400,000	698,100,000	116,900,000
North Carolina							350,025,625	
North Dakota	106,835,062	260,822	410,819			107,508,703	88,420,423	228,141
Ohio	542,952,600	12,771,127	859,704	167,587		556,751,018	539,949,877	9,275,258
Oklahoma	169,563,014		654,915			170,217,929	185,416,154	
Oregon	185,500,000	3,180,000	1,190,000		23,000,000	212,850,000	225,894,217	1,182,359
Pennsylvania	260,678,000	126,330,000	7,077,000	1,255,000	28,487,000	1,421,833,000	1,370,857,000	97,295,000
Rhode Island	35,978,963	4,536,900	1,537,217			44,053,080	35,245,890	2,707,877
South Carolina	208,364,000					208,364,000	235,070,000	
South Dakota	103,050,109	199,750	1,008,910		116,178	112,374,947	82,219,033	199,750
Tennessee							323,912,700	1,947,800
Texas	757,343,349	1,104,630	2,041,726	2,415,780		782,905,494	813,333,948	917,303
Utah	123,529,000	100,000	309,000		1,050,000	124,988,000	117,598,300	273,000
Vermont							56,740,908	
Virginia	854,344,000	14,263,843	3,035,000	4,381,770	3,478,536	685,500,149	531,232,000	
Washington	281,000,000	3,100,000	1,200,000	41,000,000	41,600,000	367,900,000	208,100,000	2,500,000
West Virginia							403,567,000	2,491,000
Wisconsin	243,018,200	3,189,400	1,485,100		175,645,000	430,337,700	273,108,500	3,962,500
Wyoming	100,064,009	17,181	1,953,090			102,034,260	109,019,231	14,374
Puerto Rico[b]	180,900,000	35,100,000	11,800,000	13,900,000		249,700,000	215,900,000	36,100,000
Dist. of Columbia	59,149,000	300,084,000				359,233,000	47,524,000	43,470,000
Total	10,321,509,874	980,541,153	234,632,421	380,745,163	604,422,183	12,521,850,704	16,228,252,086	1,072,973,530

SOURCE: Survey of state governments for summary of total expenditures conducted by the American Association of State Highway and Transportation Officials (AASHTO), Standing Committee on Planning, Washington, D.C.: 1977.

[a] Includes the District of Columbia and Puerto Rico

[b] Oregon and Puerto Rico data for 1977 derived from telephone interview with John Huett of AASHTO

[c] "Other" includes rail, bikeways, transportation for elderly and handicapped citizens, etc.

				Fiscal Year 1975					
Air	Water	Other[c]	Total	Highways	Public Transit	Air	Water	Other[c]	Total
			131,415,199	259,431,650					259,431,550
38,740,997	31,193,924		279,694,685	165,704,743		44,026,100	32,342,035		242,072,378
628,132		5,200,000	205,444,043	166,057,555	220,000	2,029,635		5,021,590	173,328,780
2,100,000	194,500,000	54,167,452	1,217,318,680	1,359,471,148				37,948,357	1,397,419,505
			180,635,000	158,449,260					168,449,260
			56,618,018	21,893,737	2,055,000				23,948,737
2,558,100	100,000		533,019,000	574,700,000	4,678,145	3,545,855	10,000		582,934,000
311,838	430,000	653,264	431,460,700	437,058,891	507,733	925,082	430,000	626,078	439,547,784
59,097,000			198,215,000	87,300,000	29,114,000	117,705,000	17,895,000		252,014,000
785,900			104,753,000	82,023,400	234,000	383,500			82,640,000
51,667,200	19,010,400	4,358,300	2,267,068,000	1,727,247,000	254,741,900	40,053,900	18,653,900	1,498,500	2,040,195,200
			249,116,695	270,072,632					270,072,632
935,880	45,813	24,650,307	264,572,834	234,977,033		600,435		3,133,166	238,710,634
12,059		4,089	236,707,569	202,424,933	59,859			20,000	202,504,792
7,079,000	450,000	20,000,000	449,459,170	417,082,436	78,701	440,544	388,590	19,104,996	437,095,270
4,120,177			493,293,461	385,397,571		740,742			386,138,313
2,968,731	1,722,310		111,739,041	109,228,000		1,309,674	1,509,669		112,047,363
24,003,220	32,674,045	119,210,717	646,063,699	350,304,000	83,232,000	24,570,000	35,092,000	141,891,000	635,089,000
533,000			341,333,000	226,600,000	51,200,000	533,000	16,180,000		294,513,000
20,200,000			466,400,000	411,800,000	25,800,000	19,900,000			457,500,000
7,215,245			316,703,661	271,410,000	6,969,000				278,379,000
356,000			331,681,000	221,318,000		270,000	21,702,000		243,287,000
	18,643,000		446,968,679						
98,000			87,821,158	88,191,117					88,191,117
7,527,000			151,569,000	127,763,000	207,000				127,960,000
			70,863,028	63,298,344	57,170				63,355,514
		8,719,988	104,315,907	99,267,426				6,058,434	105,325,860
8,680,000		5,771,000	353,203,000	211,812,183	107,783,956				319,596,139
			142,097,600	129,218,000	228,750				129,443,750
3,400,000	19,900,000	823,000,000	1,461,300,000	795,700,000	125,900,000	1,000,000	18,800,000	159,000,200	1,098,600,000
1,387,487	5,681,078		358,994,190	507,187,681		1,333,745	8,425,880		518,947,279
359,518			89,008,080	69,567,720	40,684	261,789			69,870,173
3,079,377	10,000		552,314,512	536,823,502	2,508,310	818,288			540,250,184
358,898			185,775,052	148,094,809		358,857			148,253,766
778,026			227,854,602	192,902,303	174,632	972,568			194,049,503
6,374,000	1,277,000	10,528,000	1,486,331,000	1,348,606,000	109,814,000	8,751,000	1,361,000		1,466,332,000
3,592,674			41,846,141	29,814,257	2,448,083	5,750,553			38,012,893
			235,070,000	247,600,000					247,600,000
6,731,701		61,646	89,212,130	89,291,877		8,017,378		49,000	97,358,255
11,838,900	451,000	19,513,600	357,664,000	298,019,400	14,201,000	11,999,700	500,900	29,425,600	354,147,000
1,693,075	2,215,978		818,160,304	905,130,168	181,248	1,155,244	2,012,002		908,478,742
534,600			118,405,900	95,782,800		576,200			96,359,000
733,585			57,474,493	54,092,371		1,349,198			56,331,569
1,752,406			532,984,406	558,185,000		1,788,366			559,971,366
600,000	35,500,000	4,500,000	251,200,000	269,729,674	217,145	817,386	8,449,021	45,081,781	322,295,000
504,526			408,562,528	371,300,830	2,165,317	889,041			374,145,188
8,856,100		147,839,900	433,767,000	195,888,600	3,500,000	14,264,000		142,224,800	355,877,200
2,132,473			111,166,078	136,759,366		3,064,509			139,823,875
21,800,000	17,500,000		291,500,000	244,500,000	40,800,000	20,900,000	22,400,000	7,000,000	335,400,000
			90,894,000	42,652,000	159,288,000				201,938,000
18,325,877	381,204,540	1,046,176,263	19,044,932,260	6,006,194,397	1,028,004,039	339,099,367	200,152,073	598,283,102	18,171,732,978

portion of the money expended generated through local taxes.

In contrast to local governments, which pay for their roads with property taxes, states have traditionally defrayed their share of highway construction and maintenance with revenues from user fees. The amount collected has remained relatively stable for some years,[64] while the costs of construction, maintenance, and rehabilitation have escalated sharply, particularly over the last decade.[65] The transportation of coal presents particular problems, especially for the Appalachian states. As of 1977, coal-producing states were experiencing a backlog of needed expenditures for repair and rehabilitation of roads totalling $4.06 billion, 75 percent of which was required for Federal-aid roads.[66]

A recent estimate of the number of bridges requiring replacement is 105,500, about one-third of them on Federal-aid highways.[67] The Federal-Aid Highway Act of 1970 authorized funding through fiscal 1978 for a Special Bridge Replacement Program.[68] In the 1978 Surface Transportation Act, Congress altered and extended the program, funding states to replace their more deteriorated bridges.[69] Some states are reconstructing bridges using solely state or local funds.[70]

The Special Bridge Replacement Program illustrates how Federal funds induce action on the part of the states. The DOT Secretary's Sixth Annual Report on this program notes that:

> . . . The states' high enthusiasm for this program is reflected in the increasing number of applications being submitted for the replacement of deficient bridges. Last year (1976), there were 15,587 replacement bridge applications reported; this year 16,452 bridges have been submitted.[71]

However, the Seventh Annual Report on the program indicates that, as of 1978, only 1,648 bridges had been replaced or were in the process of being replaced as a result of the Special Bridge Replacement Program.[72]

Railroads

The role of states in rail transport has varied significantly over the years. States actively promoted and regulated railroads during the 19th century, until they were largely pre-empted by the Federal government. More recently, Federal and state governments have developed a cooperative approach to railroad problems. States have confronted problems arising from the financial difficulties of the railroads, focused first on the threatened curtailment of commuter rail passenger services, and then on abandonment of freight service and trackage in light-density areas. Other matters of concern have been intercity passenger service, and safety, especially at grade crossings and in the transportation of hazardous materials through densely populated areas.

State solutions have ranged from subsidy to outright purchase and operation of rail properties. For example, Georgia has owned a major railroad line for over a century, and North Carolina has owned a controlling interest in the North Carolina Railroad for many years. In 1963, Vermont purchased the lines and facilities of the defunct Rutland Railroad, and in 1973 enlarged its state-owned system to nearly 300 miles. State-owned railroads are leased back to private operators under contracts which generally prescribe performance and maintenance standards. In some instances, operation is undertaken by connecting Class I railroads, while in others, the properties are run as short lines.[73]

The 3R Act brought about the creation of Conrail and Federal purchase of the Boston-Washington corridor. The act also led to federally subsidized service on about 3,000 miles of light-density freight lines, with subsidies administered by the states.[74] In 1978, Congress acted to make the program permanent, with a standard matching ratio of 80 percent for capital projects.[75] The states determine which services are to be subsidized, but to be eligible for funds, a state must have established a plan for rail transportation and local rail services. In 1978 all 17 Northeastern and Midwestern states as well as ten others had completed their state rail plans, with all other states in some stage of development of a plan.[76]

As to rail passenger transport, state and local interactions with Amtrak have developed through Section 403(b) of the 1970 Rail Passenger Service Act, which stipulated that if state, regional or local agencies desire additional service beyond that which Amtrak is providing, they must assume "a reasonable share" of the costs, first defined to be not less than 66.6 percent.[77] In 1974, exactly 66 and 2/3 percent was specified.[78] In early 1976, Congress changed the ratio to 50 percent, and later that year required non-Federal sources to cover 50 percent of both solely related costs and associated capital costs for 403(b) routes.[79] A number of states and regional agencies have taken advantage of this provision and expanded or added services not otherwise provided.[80]

To ensure commuter rail services, some states make payments directly to the carriers providing the services. Several states have also created special regional transportation authorities, composed of the counties and municipalities requiring these services.[81]

Ports and Waterways

Port activity is carried out by both public and private interests. Public port authorities, functioning under cities, counties, and states, are the primary developers of transfer facilities for general cargo. Private corporations usually own and operate bulk facilities, particularly for petroleum, as a part of overall physical distribution systems. Ports are located in 38 states (those bordering the Atlantic, Pacific and Gulf Coasts, the Great Lakes and inland waterways).[82]

The institutions responsible for ports at the state and local level vary considerably. A recent survey found that 12 of 33 states had state port authorities, 12 had a ports agency within a state DOT and 9 had no particular state port agency.[83] In states without port administration capabilities, local public port functions are administered by municipal and county authorities.[84] The same survey indicates that: ". . . the financing and management of the port is divided among state and local governments, and private enterprise."[85]

A port-related issue is containerization. Present warehousing facilities are becoming obsolete, and containers require additional space. Because most ports are located in metropolitan areas, their ability to expand is limited. In addition, equipment needed for moving containers is expensive, posing financial burdens for ports.[86]

Foreign trade is expected to expand from the current 800 million tons annually to 1.4 billion tons by the year 2000, pressuring ports to achieve further productivity.[87] However, more funding for port development may be difficult to obtain from state and local governments, simply because ports are not an integral part of the state financing system and must compete with other budgetary priorities. Consequently, states may have to seek new sources of funding; perhaps ports may have to become financially independent, increasing user charges to cover costs.[88]

Mass Transportation

Mass transportation historically was provided at the local level by private firms. Although local governments and non-profit organizations are commonly involved today in the provision of transit, some transit functions are performed by states. These functions can include financing, conducting technical studies, collecting and analyzing data, administering programs for rural, elderly and handicapped passengers, as well as actually operating a system. Widespread public takeovers have changed the nature of local regulation.[89]

Title III of the Surface Transportation Assistance Act amended Section 16(b)(1) and provided a new Section 18 to the 1964 UMT Act,[90] authorizing capital grants to states for the provision of public transportation services to the elderly, the handicapped and residents of rural and small-urban areas. Section 504 of the 1973 Rehabilitation Act requires all programs or projects receiving Federal aid to be accessible to elderly and handicapped persons.[91] On June 6, 1978, DOT issued a series of proposed rules and in April 1979 submitted a program to HEW with phased steps for ensuring that transportation facilities comply with Section 504.[92]

States may also plan for public transportation, and new Section 8 of the 1964 UMT Act[93] provides planning requirements and funding for this purpose. Under Section 5 of the National Mass Transportation Assistance Act of 1974, local areas with a population between 50,000 and 200,000 can receive Federal operating assistance via the states,[94] and under new Section 18 of the UMT Act, operating assistance is also available to small cities and rural areas.[95]

In some states, intercity buses may provide important service for residents of non-urban areas. Six states assist intercity bus companies, with programs ranging from no-interest loans to operating subsidy.[96]

Local governments support transit, with substantial Federal participation. The figures in Table 9 indicate how much money the Federal government may provide. The 1964 UMT Act, as amended, offers 80-percent Federal, 20-percent local matching grants for capital costs, and 50-50 percent matching grants for operating expenses. By mid-1974, UMTA grants to local areas for transit capital projects exceeded $3 billion. Over 90 percent of the capital grants were appropriated to 6 cities starting new rail transit lines, and to 230 cities buying some 20,000 new buses.[97] The Federal-Aid Highway Act of 1973[98] offered $2.38 billion from the Highway Trust Fund over two years (1974 to 1976) for construction of urban transportation facilities, fringe or corridor parking facilities, and bus purchases, as well as for the construction or improvement of rail facilities.

An important and controversial aspect of the UMTA legislation, Section 13(c), protects employees of projects receiving UMTA funding ". . . against worsening of their positions with respect to their employment."[99] Some local government officials perceive compliance with this regulation as expensive and thus in certain cases have foregone Federal financial assistance in favor of local funding of transit.[100] Although some studies have been done regarding the overall effects associated with 13(c),[101] controversy continues.[102]

The provision of public transport services in rural areas is hindered by low-density patterns and dispersed activity, combined with the fact that rural public transportation traditionally has received little Federal attention. However, change came with a 1974 amendment to the UMT Act, which provided $500 million for planning, capital costs and demonstration projects, reserved specifically for transportation in non-urbanized areas.[103] In 1978, this program was amended to offer $420 million through fiscal year 1982.[104]

One partial answer to the problems local governments face in serving special groups may be found

TABLE 9. Urban mass transportation administration capital grants by fiscal year and program 1965 through 9-30-78 (number of projects in parentheses)

FY.	Section 3[a]		Section 5 Capital		Urban Systems		Interstate Transfers		Total Capital Grants	
1965 to 1970, inclusive	(148)	$ 681,227,695		—		—		—	(148)	$ 681,227,695
1971	(49)	284,786,042		—		—		—	(49)	284,786,042
1972	(66)	510,000,000		—		—		—	(66)	510,000,000
1973	(95)	863,708,000		—		—		—	(95)	863,708,000
1974	(120)	870,299,997		—	(2)	$ 34,566,597	(1)	$ 51,000,000	(123)	955,866,594
1975	(166)	1,196,600,868	(14)	$ 9,062,495	(5)	15,676,374	(2)	65,728,784	(187)	1,287,068,521
1976	(103)	1,092,190,977	(27)	25,514,821	(8)	23,437,755	(3)	337,494,988	(141)	1,478,638,541
T.Q.	(20)	253,909,023	(10)	6,741,960		—	(4)	215,553,758	(34)	476,204,741
1977	(137)	1,249,999,998	(76)	39,443,964	(7)	41,996,625	(1)	392,301,016	(221)	1,723,741,603
1978	(181)	1,400,000,000	(74)	50,112,435	(8)	30,441,481	(3)	556,350,328	(226)	2,036,904,244
Total	(1085)	$8,402,722,600	(201)	[b]$130,875,675	(30)	[c]$146,118,832	(14)	[d]$1,618,428,874	(1330)	$10,298,235,981

SOURCE: Urban Mass Transportation Administration, Office of the Associate Administrator for Transit Assistance, Washington, D.C., March 1979.

[a] Including advance land acquisition loans and Section 16(b) (2) grants.

[b] All for bus transit except: $700,000 rail rapid transit, $308,000 ferry boats.

[c] Of this total, $69,884,875 in rail rapid transit, $11,867,789 in commuter rail, $33,924,687 in buses.

[d] Of this total, $921,952,248 in rail transit, $115,953,548 in commuter rail and $24,172,750 in advance land acquisition loans.

through paratransit services, including ride-sharing options such as car pools, van pools, taxis and dial-a-ride.[105] These services are particularly valuable in rural areas where fixed-route transit lines may not be cost-effective. UMTA has stipulated that for taxicabs to be considered a paratransit mode, they must be available on a regular and continuing basis, as is mass transit. Because exclusive-ride taxi service is usually not included in the definition, only shared-ride taxi trips meet the criterion.[106]

Funding Problems

Major issues are engendered by Federal programs that disperse funds to state and local governments. How the money is apportioned, to what purpose it is put, what provisions are made for interface with all jurisdictions below the Federal level, and how dependable the funding is over time—are all factors profoundly influencing which projects and programs will be undertaken by states and localities.

State and local governments receive either project funds or other forms of assistance from the Federal transportation administrations. Assistance is provided at different matching ratios for each mode, with some modes receiving far more aid than others. Even though many Federal agencies have supported intermodal planning, allocation formulas do not reflect that goal. State and local governments wish more flexibility to use Federal funds for different demands based on their geography, demography or economy.

Distributing funds along modal lines not only may impede planning for efficient, coordinated transportation services, but it also can create biases for one mode over another, strictly on a financial basis. In January 1978, President Carter proposed to consolidate transport funds and increase their flexibility, and to decrease disparities in matching ratios of FHWA and UMTA grants.[107] Such a proposal faces considerable opposition from highway and transit supporters. Also, Congress has appeared to favor modal, categorical programs.

In some cases, state and local governments receive Federal aid when it might be more efficient for them to deal directly with their own problems. Some states believe proceeding under FAA's process demands more time and money than state control would require in those states having administrative capacity.[108] Considerable inefficiency is believed to result from the process of collecting user charges, placing the funds in the Airport and Airways Trust Fund, and then channeling the bulk of the funds collected back to hub airports (based on enplanements) through the ADAP program. Perhaps a greater problem is that this source of funding creates biases in spending decisions.

Another funding conflict emerges when needs change, but allocations do not. For example, while highways and bridges have been promoted through funding for construction, little money was provided until recently for reconstruction or rehabilitation. Some states believe that Federal money should be available for repair and maintenance.[109] Yet, left to their own devices, states might find alternatives themselves, such as abandonment or transfer of low-use roads and bridges. In other words, the possibility of receiving Federal dollars can create expectations which might eliminate a creative or more cost-effective approach by the recipient.

Some local officials find applications for aid too complex to bother filing;[110] others complain that excessive "red tape" involved in grant applications causes a time lag between filing and grant approval. This delay, sometimes lasting 10 to 15 years,[111] can escalate project costs 100 percent in dollar terms.[112] Even after funds are allocated for a program, there is no assurance of continuity of a grant. Local officials insist that a guaranteed source of funding is vital to maintaining transport services.[113]

The cost of complying with a Federal program may also prove troublesome. For example, the cost for Washington's Metro System to comply with UMTA's Section 16 is expected to be $4.9 million a year in 1973 dollars.[114] The total cost of compliance with Section 504 of the 1973 Rehabilitation Act will be $1.7 billion in 1977 dollars, according to UMTA estimates, while FRA and FAA project costs will total $56.6 and $40.0 million respectively.[115]

A final area of intergovernmental discord on funding occurs when the Federal government circumvents a government level by providing financial aid to an area within that government's boundaries. Mass transit funds frequently go to local governments without channeling through the states, even though a state may be asked to assist in the local match for Federal money.[116] Similarly, funding for paratransit or special transport services may go to several private, non-profit organizations within a city, county or parish, a process that often results in duplication of service.[117] A recent administration proposal would provide direct funding for MPOs, which in the past have been strictly planning organizations.[118] Representatives of MPOs, local, county, and state governments, all support direct Federal funding to themselves because it would reduce red tape; at the same time, they often fail to consider the effects on other governments of the particular solution they desire.[119]

REGULATION

State and local governments may regulate economic, environmental and safety aspects of transportation.

Generally, PUCs and PSCs regulate the intrastate transport of freight and passengers by truck, rail, intercity bus and occasionally air. Not all PUCs restrict themselves entirely to economic regulation; they may regulate abandonments or discontinuances, safety, construction projects, equipment, security issues and rail grade crossings. Local governments may regulate transit in instances where it is privately owned. Since public ownership became predominant, local governments have usually confined themselves to regulating taxicabs and some forms of paratransit, such as limousines.

Environmental Regulation

Most state governments have had agencies responsible for water pollution control since the 1940s, but they have been slower to create similar institutions to control air pollution.[120] The 1970 Clean Air Act required each state to develop and submit to the EPA a State Implementation Plan (SIP) that would provide for the attainment, maintenance, and enforcement of national air quality standards by 1977.[121] However, through the 1977 Amendments to the Clean Air Act, Congress stipulated that urban areas with the worst problems would have until 1987 to attain national standards. The amended act also mandates that, if a plan is not approvable, EPA is to develop one in its place. For urban areas where the standards for mobile-source-related pollutants are being violated, the states are required to submit, as a distinct portion of the SIP, a transportation control plan (TCP) consisting of measures to reduce emissions from those sources. The 1977 Amendments require that each state have mandatory inspection and maintenance programs for automobiles, as well as various other plans.[122]

Through the Clean Air Act Amendments, Congress also sought to remedy shortcomings of the first TCPs by shifting responsibility for TCPs from states to MPOs.[123] This created controversy, however, as MPOs have the responsibility for coordinating plan development, but lack any implementation power. Nevertheless, if a TCP is not submitted to EPA on time, or if reasonable efforts towards doing so are not made, or if annual emissions reductions do not occur, the Clean Air Act states that for such an area:

> The Secretary of Transportation shall not approve any projects or award any grants under title 23, United States Code, other than for safety, mass transit, or transportation improvement projects related to air quality improvement or maintenance.[124]

Both state and local governments are also required to prepare environmental impact statements whenever they consider developing a project that may have environmental, economic or social impacts.[125]

Safety Regulation

Safety regulations have been promulgated for all modes, involving the movement of unsafe or hazardous cargo, the operation of vehicles, driver licensing and behavior, and numerous other aspects of vehicle use and interaction. Safety regulation is enforced by state or local DOTs, PUCs and policing agencies such as highway patrols and sheriffs' departments.

Regulation Problems

Regulations of one state can create problems that affect other states. For example, motor vehicle sizes and weights are regulated, but where the permitted dimensions differ among the several states through which a vehicle must travel, interstate commerce may be impeded. Another problem at the state level arises when the organizations responsible for regulatory activities do not coordinate their activities with state agencies responsible for planning or projects, despite the fact that their jurisdictions overlap.

Regarding local regulation, restrictions on taxis and jitneys may have put such forms of paratransit at a competitive disadvantage versus the private auto and conventional transit, despite paratransit's ability to provide accessibility to special populations that are not otherwise well-served.

With both Federal and state environmental regulations for local transportation projects, duplicate standards face local officials. As of 1976, 26 states had EIS requirements,[126] causing local governments to file a statement to both the Federal and state government, according to each level's standards. Local officials point to such duplication as contributing to the mass of red tape surrounding project approval.[127] Federal project regulations may also be too stringent for every case, giving local governments incentive to avoid them.

States regulate pipelines as long as their regulations ". . . do not interfere with or occupy an area already occupied by ICC or DOT regulations."[128] Railroads consider promotion of coal slurry pipelines to be contrary to their interests. Because such pipelines may need to cross railroad lands, the issue of eminent domain has become critical, particularly to states in which coal is produced. The use of water by slurry pipelines is subject to stringent water-use laws in most Western states. Two states' statutes specifically prohibit the use of their water in coal slurry pipelines,[129] and others allow it only if there is a water surplus.[130]

STATE AND LOCAL TRANSPORTATION POLICIES

State and local transportation policies are expressed through legislation, plans and policy statements, and through the interest groups representing those governments. As part of its activity of gathering policy information from state and local parties, the NTPSC conducted public hearings in Washington, D.C., Seattle, Denver, Los Angeles, Newark and several other locations, during which officials from around the country expressed their views on transport issues and policies. Statements submitted to the NTPSC identified policy issues, and recommended policies either on a modal basis, or on the basis of government's role in the provision of transportation.

Testimony was received from local officials throughout the country, as well as from the National League of Cities (NLC), the U.S. Conference of Mayors (USCM) and the National Association of Regional Councils (NARC). State legislators and governors testified, as well as public interest groups representing the states, such as the American Association of State Highway and Transportation Officials (AASHTO), the National Governors' Association (NGA) and the National Conference of State Legislatures (NCSL).[131]

STATE GOVERNMENT ROLE

According to policy statements submitted to the NTPSC, state representatives feel that the state function should be to set statewide transportation priorities. Major recommendations were that the states: develop a uniform set of planning guidelines; design multimodal state plans; design TIPs in cooperation with local governments; provide technical assistance and financial aid for transportation projects; pass laws in support of policies; continue to develop state DOTs; coordinate Federal funding for transportation planning in urban areas; and maintain full responsibility for transport programs within their borders.

LOCAL GOVERNMENT ROLE

Representatives from state government see three major roles for local governments in transportation: the construction of local transport facilities; the operation of special transport services; and the planning of facilities and services in cooperation with state governments.

Local government representatives focused on the need for increased local control of transportation decisions. Local officials emphasized decentralizing the responsibility for planning, developing and implementing urban transportation, allowing municipalities that differ demographically, physically and economically to meet their own needs and goals.

FEDERAL GOVERNMENT ROLE

Policy statements submitted to the NTPSC recommended various modifications to the Federal government's role in transportation. State officials emphasized the need to produce policies for a truly multimodal transportation system, responsive to the needs of the states. They urged that the Federal government continue to give financial and technical assistance. At the same time, they advocated discretionary power for states in using these funds, with dollars earmarked for local and regional projects channeled through the states. Officials emphasized the need for less Federal control, especially in the number of categorical grant programs. They also stressed a desire for cooperation in such areas as the A–95 review process, and a need for clarification of a variety of environmental acts. Finally, they called for a restructuring of the U.S. DOT.

PLANNING POLICIES

Representatives from local governments advocated multimodal, regional transport policies that are consistent with other regional programs and plans. Transportation funds should be used to develop programs based on regional needs rather than on funding sources. Railroads and public transportation in particular should be emphasized as stimuli vital to the encouragement of balanced regional growth.

FINANCE POLICIES

State issues regarding transportation aid include: the need for assured Federal funding of transportation projects, combined with the need for transferability of these funds to different projects with minimal restriction; the provision of Federal aid for transportation projects of national scope; the provision of Federal transit support for construction only; and the elimination of categorical funding restrictions.

Local recommendations for funding to urban areas include: provision of long-term Federal financing; making funds available for multimodal purposes; amending Federal-aid highway laws to increase the minimum Federal share of all projects to 80 percent, and to enable any major unit of local government implementing highway programs to distribute highway dollars under state law; apportioning Federal-aid urban system funds directly to urban counties and parishes according to a formula based on population; and allowing local officials to control block grant programs for capital, maintenance and operating expenses.

INDIVIDUAL MODAL POLICIES

Aviation

Major issues identified regarding aviation were: the need for runway rehabilitation; the need for providing commuter air service to smaller communities, as well as for simplifying certification procedures, rules, and regulations affecting commuter airlines; the need for providing funds on a continuing basis so that states may schedule projects in support of their plans; the need for intermodal connections at airports; the need for greater state participation with Federal agencies such as FAA and CAB; the need for the Federal government to develop plans regarding the use of the Airport and Airways Trust Fund; and the participation of states in the development of the National Airport System Plan.

Highways

Representatives from state governments emphasized construction, maintenance and rehabilitation requirements of the Interstate System, rural and urban primary roads, and bridges. Among the issues identified were the need for: additional Federal funds for Interstate highways; Federal support of the rural secondary road system; improved traffic management; continued Federal-aid and simplification of requirements for the Highway Safety Program; resolution of truck size and weight issues, either allowing more individual state discretion or more extensive standardization; and modification of Highway Trust Fund allocations.

Local officials emphasized that the deteriorating condition of the nation's highways and bridges is crucial. They advocated flexible funds so that local areas can decide on appropriate use and set efficient standards to meet local needs. Bridges both on and off the Federal-aid system are a primary example of such local needs.

Railroads

The major policy issues formulated by state officials regarding railroads involve planning and rehabilitation of facilities and systems. Statements submitted to the NTPSC expressed the following needs: Federal programs to fund reconstruction; regulatory reform policies; programs that support more productive rail labor; Federal funding for railroad facilities handling energy-related traffic; timely funding for states preparing rail plans in accordance with the 4R Act; legislation that would allow transfer of property from carriers to states without the present abandonment process, in instances when abandonment seems imminent; programs for rehabilitation of equipment and upgrading of deficient bridges and unsafe grade crossings; interaction between states and Amtrak when that organization is planning to change levels of services; and a rail trust fund, financed through user fees or general funds.

Transit

Major transit interests include: the concept of mass transit corridors; upgraded facilities and rolling stock; a stronger role for states in programs of Federal assistance to local governments; strong local participation in the development of transit for elderly, handicapped and rural residents; all levels of government to participate in funding; and funding to be exempt from the Department of Labor's interpretation of Section 13(c).

Multimodal Transportation

Because of the need for a national, multimodal, transportation system, recommendations emphasized: the transfer of money for non-essential sections of the Interstate system to urban transit, as well as for the rehabilitation, restoration and resurfacing of the Interstate system; and more Federal funds for multimodal planning at the state and local levels.

Water Transportation

Key issues regarding water transportation include the need for: comprehensive planning of waterway systems and their inclusion in national transportation plans; improved coordination of water transport with other modes, with the provision of intermodal transfer capabilities in port development; assessment of user fees according to the benefits accruing to the area around a water project; and development of uniform safety standards for construction, maintenance, and operation of watercraft.

REGULATORY POLICIES

The extensive red tape and regulations emanating from various Federal agencies cause major problems for local governments. Policy issues from the local viewpoint include the need for streamlining the EIS process for all TIPs, and the need to end duplication in the Federal review process.

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15. Urban Mass Transportation Act of 1964, 49 U.S.C. section 1601 *et seq.* (1976), Pub. L. 88–365, 78 Stat. 302. (Hereafter cited as UMT Act).
16. Department of Transportation Act of 1966, 49 U.S.C. Section 1651 (1976), Pub. L. 89–670, 80 Stat. 931.
17. The State Assembly authorized approximately half the funds requested by the Welfare and Highway departments for tickets and transport services respectively in 1979. For the first time in TRIP's history, there was also minimal financial assistance from the localities. Program officials anticipate the balance of their budget will come via emergency relief funding from the Governor's office. L. Andre Roy, Senior Planner, Rural Transit, Transportation Division, West Virginia Department of Finance and Administration, Charleston, West Virginia, telephone interview, 10 October 1978, and Susan O'Connell, Accountant, Rural Transit, Transportation Division, West Virginia Department of Finance and Administration, Charleston, West Virginia, telephone interview, 27 April 1979. TRIP refers to Transportation Remuneration Incentive Program, which was originally financed by several Federal agencies.
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Comparative Transportation Policies in Other Countries

4

INTRODUCTION

Developments in the past few decades have brought the United States and the developed countries of Europe and Asia closer together in terms of transportation experience and public policy issues. This growing comparability makes the experience of other nations with various transportation policy approaches—both the successes and failures—increasingly relevant to U.S. policy formation. The shared nature of the energy crisis, in particular, has reinforced the commonality of problems and potential solutions facing all developed nations. Still, care is required in transferring experience, given the real differences in physical and economic circumstances between nations.

Materials identifying the domestic transportation policies of selected countries, relating to all modes and market sectors, are assembled in this chapter. Five major policy categories used in the Commission's work provide a framework for discussion. These categories are: regulation; ownership and operation; finance, pricing, and taxation; planning and information; and government organization.

The energy situation illustrates the benefits that can be derived from international discussions of technology and public policy. Prior to the energy crisis, domestic policies were generally not discussed in international forums for two reasons: (1) nations did not want other countries intruding in their internal affairs; and (2) nations believed their unique circumstances precluded application of policies developed in other countries. Discussions among developed nations were limited mainly to those national policies which directly affected other countries, and the discussions were formal and self-interested. There were exceptions, of course. The European Conference of Ministers of Transport and the Organization for Economic Cooperation and Development (OECD) had addressed domestic policy questions in several areas well before the stimulus of the energy crisis. However, the common threat of energy shortage made clear that the policy tools available to nations (even those with substantially different political systems and physical circumstances) were not dramatically different, and that policies tried and proved successful in one nation could also prove successful in other nations, if care was used in selection and application.[1]

The range of comparative transportation policy is as broad and diverse as the disparate problems and circumstances of the nations involved. In order to focus this review, nations and policies have been selected on the basis of relevance to U.S. concerns, and comparability with U.S. experience.

BENEFITS OF COMPARATIVE POLICY STUDIES

Time and money may be saved and mistakes avoided if nations learn from the policy experiences of other countries. Many reasons exist for studying domestic policies:

1. *Policy alternatives under consideration in the U.S. may have been considered and researched elsewhere.* Experience may have demonstrated the outcome of a particular policy, at least for a given set of circumstances. Even if circumstances are dissimilar, the experience may help reduce the number of avenues to be investigated. Again, the energy situation is an excellent example. The tools available to each nation were roughly the same. But innovative ideas arose as each nation selected different policy tools to suit its situation and values. The U.S. learned about alternatives selected elsewhere, how they worked, why and what factors controlled success. For instance, the U.S. avoided gasoline rationing. Two countries in Europe, Sweden and the Netherlands, did try it. They discovered that unless the shortage is greater than 20 to 25 percent, rationing creates more problems than it solves.[2]
2. *Other nations facing comparable problems may have generated innovative solutions.* Often simply identifying where a similar problem has occurred, and where it has not, can be instructive. (An example of this point is the Singapore road-pricing experiment in which auto access to downtown at

peak hours requires an expensive permit. Although there are few more dissimilar countries than the U.S. and Singapore, the U.S. DOT is providing funds to monitor the effects of the Singapore project.)[3]

3. *Methods and institutions developed in disparate circumstances provide a sensitivity test for choice.* Often the very differences between nations are valuable. Distortions introduced by these differences illustrate the strengths and weaknesses of prospective policies under varying conditions. Different values employed in decision-making elsewhere can provide a methodological and political testing ground for prospective conditions in the U.S. (The demand for autos and single-family homes in Sweden, despite excellent town planning, extensive transit service and high auto-related costs, indicates a great deal about the strength of individual demand for these goods.)[4]

DETERMINING RELEVANCE AND COMPARABILITY

Some of the examples of benefits presented above support the point that strict comparability between nations is not always essential to benefiting from the experiences of other nations. Sometimes the differences themselves are a valuable part of the lesson. However, in many cases, the comparability between circumstances in different nations is highly important to the relevance of the potential policy interchange.

The factors to be considered in determining comparability are presented briefly here.[5] Because the success of many policies depends on their ability to affect choices made by purchasers and providers of transportation, the comparability of the environment in which choices are made is often the central issue in determining transferability. Comparative analysis involves three major considerations:

1. *Socio-Economic Comparability.* Are the earning power and demographic characteristics of the populations involved similar?
2. *Comparability of the General Decision Environment.* Are the general goals for transport the same? Is the marketplace context comparable?
3. *Comparability of the Specific Decision Environment.* How broad is the decision context? What constraints are placed on alternatives?

While extensive research could be undertaken on each occasion where comparability is in question, in fact, most cases of policy comparison are sufficiently self-limiting as to make the bounds of comparability clear.

FACTORS IN TRANSFERABILITY

Comparability determination leads naturally to assessment of transferability. However, the transfer of public policies from one country to another introduces the political decision-making process, which rests on a combination of attitudes shaped by culture and history. The attitudes underlying the formulation of government transportation policies in Europe and Japan differ significantly from U.S. attitudes. The European and Japanese outlook was influenced by the early formation of state railways of national scope (mainly before 1940) and the late rise of the motor vehicle as a widely used means of transportation (after 1955 or 1960, except in England).[6]

Railways in other countries have been instruments of national policy for 50 years or more. State proprietary interest has been expressed in a very strong "railroads first" policy, reflected in part in intermodal coordination and the division of markets. Railroad enterprises have been directed to support the development policies adopted by a state, and have been expected to give full cooperation.[7] This policy contrasts sharply with U.S. practice, which has assumed that the sum of actions of individual enterprises acting in their own interest (or under regulatory restraint) would satisfy a national interest not defined in any plans or explicit statements of objectives.

An effect of long-time public ownership is that railroads in other countries became instruments of social policy. In addition to ubiquitous service, the railroads provided free and reduced-fare transportation for select groups and they became employers of last resort. The latter function has been widespread, especially in the southern tier of European countries bordering the Mediterranean.[8] This role has been so comfortable politically that reduction of rail employment has been very difficult, even under extreme pressure from the World Bank in connection with modernization loans.[9] Social burdens are a major cause of the huge deficits incurred by practically all state railways, and have prompted many of the steps taken to maximize railway revenues, even to the extent of very restrictive controls on for-hire truck and bus transport.[10]

Some countries have become disenchanted with using railways as instruments of national policy. Despite strong promotional support, most nationalized railways incur huge deficits and, in fact, no nationalized railway has reported a profit since 1964.[11] Also, nationalization is failing, in the long run, to prevent rail rationalization. An example is the British railway system which was nationalized in 1948. Since that time the British government has eliminated 387,000 jobs (60 percent of its work force), and 9,000 track miles (45 percent of its total).[12] Similar cutbacks are either occurring or proposed in Japan, France, and West Germany.[13]

Attitudes toward the motor vehicle, especially private cars, were shaped during a 50-year period in which cars were universally viewed as a highly taxable luxury of the wealthy, not an everyday necessity supplanting public transportation. In Europe, high gas taxes, restricted parking, and heavy purchase taxes are common, even though auto owners are now in the majority.[14] During this same period the U.S. was fostering, by public actions, the widespread use of private cars.

LESSONS AND OPPORTUNITIES

There may be policies of other nations that are worth significant consideration in U.S. policy formulation. Such policies are explored below, using the NTPSC's functional categories to link the observations of other national experience to sectors of U.S. policy concern. Relevant policies in each sector are set out, followed by a brief discussion of differences in goals and objectives between the U.S. and the nations whose policies have been investigated.

REGULATION

Regulation is one of the more important areas for cross-national comparison, although it is also the one in which comparability is the most difficult to establish. Regulatory policy often moves through phases emphasizing greater or less control. Examination of the policies of countries in advanced regulatory phases can provide significant insight.

Intercity Passenger Transport

A notable regulatory policy affecting intercity transport service is the complete ban on intercity buses in some countries, where they might compete with rail services. In Switzerland, this policy is determined by national planning in which the best mode is selected by government planners; service by that mode is then supported and the competing mode is banned.[15] In the U.K., bus is most often used as the mode providing intercity access to inhabitants of rural low-income areas, where demand does not support rail service.[16] In many countries, bus and rail are seen as alternative solutions to the same problem, with selection of one or the other based on demand levels, existing rail right-of-way and terrain. They are rarely offered as services operating in parallel. In Spain, for instance, bus carriers have been taxed at three levels, at an increasing rate as the carrier's route comes closer to paralleling rail service.[17] Regulatory constraints do not usually extend to charter bus operations.[18]

In European transportation, fewer than 10 percent of the major airports are interconnected.[19] Route controls generally support a "hub" approach, with the national capital as the hub fed by flights from the national hinterland.[20] Few flights from secondary cities provide direct service, national or international, to other cities.[21] Air entry in Australia is controlled by strict rules on the import of commercial aircraft.[22]

Freight Transport

European freight transport has been moving toward rate and entry deregulation. Most European countries, Australia, and Canada have shown preference for deregulated rail and truck services. West Germany and Japan, on the other hand, have retained substantial regulatory control. Several trends are discernible in this policy area:

1. Entry and rate deregulation is practically complete in the U.K. and France. Although both countries are interested in protecting their rail systems, the approach has been to strengthen the railroads by freeing them from regulation. The nationalized rail system in the U.K. also provides trucking services. Safety regulation of trucking in the U.K. has been transferred to motor vehicle licensing authorities.[23]
2. Controls on the capacity of the truck fleet were used in the past in France, West Germany, and the U.K. to limit trucking growth. Similar capacity controls are employed for coastal shipping in Japan to limit competition with Japan's railroads. In France, a "normalizing" subsidy to the rail system is provided because it is believed that truckers do not fully pay the costs to the roadway engendered by heavy vehicles. In West Germany, a truck quota system has caused high prices for truck operating certificates. In the U.K., truck deregulation has caused a shift from private to for-hire trucking.[24]
3. The Common Market (EEC) has exerted considerable influence on international surface-freight regulation, which affects domestic policies. An important EEC regulation is control of truck driver activity, including maximum hours per day (8), and per week (48). A Swiss regulation prohibits large trucks from moving on weekends, a policy designed to support rail and reduce conflicts with tourism. A similar policy is employed in France.[25]

Urban Transport

Regulation in urban transport is limited, but more extensive than in the U.S. The focus of most regulatory policy is toward protecting city centers from impacts of the auto and truck. Particularly significant policies include:

1. Extensive use of pedestrian areas, or "auto-free zones." Almost all major European cities have such areas, generally encompassing and protecting medieval city centers. In some cases only transit access is permitted; in others no vehicles at all are permitted. Extension of these concepts to residential areas is a recent change.[26]
2. A complementary policy to pedestrian areas is the use of traffic "cells." The downtown is divided into "cells" and access to each is possible only from the periphery. No access between cells is permitted, thus forcing through traffic onto circumferential facilities.[27]
3. Strict on-street and off-street parking regulations are often employed to reduce the amount of parking available or to make it prohibitively expensive for all-day use.[28]
4. Right-of-way policies are considerably more stringent than in the U.S. In most major cities, regulation almost prohibits additional land-taking for transportation, particularly for freeway-type development. This ban has placed design emphasis on intense utilization of existing road space, including use of exclusive facilities for transit or bicycles. It has also focused on diverting traffic, especially trucking, around cities via "ring-roads" (i.e., U.S. "beltways").[29]

OWNERSHIP AND OPERATION

Operating and service policies in Europe emphasize integrated and coordinated transport service to a greater degree than in U.S. practice.

Intercity Passenger Transport

In intercity passenger transport, the organization of bus and rail services into an integrated system, with coordinated schedules and prices, has proceeded far beyond the U.S. At least in part, integration is a product of replacement bus service following the routes of abandoned rail passenger service. There are also strong links between intercity and urban surface-transit modes and between transit and airports. It is recognized that terminal delays strongly determine the ability of transit to compete with the automobile. For trips under 200 miles, terminal delays make rail 30 to 40 percent slower than the auto; rail's potentially higher speeds do not compensate for terminal delay up to distances of approximately 500 miles. To overcome these constraints, operating policies are directed at attaining rail speeds in excess of 60 mph (100k/h), including all stops.[30]

Extensive use of quasi-public corporations in France to operate toll roads is an important part of French ownership and operating policies. However, high tolls and poor road quality have had the effect of diverting trucks back onto the older rural-road system.[31]

National development policies recognize the role of transport service availability in regional development. For example, the Japanese national transport plan is specifically designed to promote the shift of population and economic activity away from the populous Pacific corridors.[32] In Europe, proposals of the OECD for policy consideration have included special services to assist the development of secondary corridors.[33] Tourism plays a major role in service policies, unlike the U.S. situation. Thus, although regular air service between cities is high priced, substantially discounted fares have traditionally been available on special services, such as charters to non-urban tourist centers.[34]

FINANCE, PRICING, AND TAXATION

The major outlines of pricing and finance policies in other developed countries are similar to U.S. policies. Although the general principle behind many of these European policies is that users should pay the costs generated by their use of the transportation system, the degree to which this principle is applied varies considerably from country to country and from mode to mode. Despite this variation, the principle still serves to characterize the direction and intent of pricing policies in most developed countries. A significant result of application of the principle is that exceptions to it must be openly identified and carefully justified.[35] The major controversies regarding the application of this principle have occurred in the area of highway finance. Although highway users as a group may pay more than the cost of highway use, in many countries—notably England, France, Germany, Switzerland, and Australia—statements suggest that the heaviest trucks are not adequately covering the costs they exact on the road system.[36] In each of these countries, remedial policies are under consideration in the form of higher user fees for motor carriage.

There are also significant policy differences to be noted. Some of those relevant to U.S. policy concerns are discussed below.

Intercity Passenger Transport

In intercity passenger transport the extent to which pricing and finance policies are employed to direct activity toward a preferred mode are extraordinary, by U.S. standards; for example:

1. Highway use taxes not only repay highway costs, but also generate large surpluses assigned to other transport areas or to general revenue. In France these funds accrue from high fuel taxes (approximately $2.00 per gallon) and an extensive toll system on the major intercity express highway routes. In West Germany surplus highway fees are allocated to support rail deficits. In addition to high taxes on fuel, the fuels themselves are priced at current world prices, as opposed to U.S. regulated prices. Thus, fuel has typically cost four times as much per gallon as in the U.S. In Australia local user fees and property taxes cover road costs but national revenues from user taxes exceed costs, thus generating net revenue.[37]
2. Rail fares are generally subsidized by a variety of mechanisms, including: 50 percent discount fares for commuters on the Japanese National Railway; discount fares to different social groups (e.g., large families, veterans); allocation of maintenance costs to the freight sector, as in France; or, also as in France, subsidy for rail labor costs in excess of "typical" labor costs. Coupled with these efforts at reduced rail fares are policies that keep intercity air fares high. With discount international air fares on the North Atlantic, fares from New York to cities in Europe are often cheaper than fares between European cities. (However, recent events indicate that the discounting of air fares will become significant in European domestic markets.)[38]

Freight Transport

In freight transport, policies based on payment of full costs by users are pursued with varying degrees of adherence and success. Notable policies are the following:

1. In England the nationally-owned rail system has pricing freedom, including permission to negotiate private contract rates, and is expected to recover all costs attributable to freight service. In its 1977 transportation policy "White Paper," the government indicated that it did not intend to provide further support to rail freight. (In fact, in 1977, British Rail did incur a small deficit of just over $10 million, down from $132 million in 1975.)[39] An exception to this policy provides subsidies to businesses to establish direct rail sidings at their facilities. This support is based on the view that the most significant opportunities for rail competition to trucking lie in siding-to-siding movements where truck interchange is unnecessary.[40] Almost an opposite condition exists in Japan, where the distances from factory to siding induced by regulation have made rail traffic highly susceptible to truck competition.[41]
2. In France, Spain, Sweden, and Finland, freight rates may be subsidized to promote regional development. Subsidy is often coupled with tax incentives to foster industrial relocation in underdeveloped areas.[42]
3. Port pricing and finance policies vary considerably. Generally, large subsidies go to ports for dredging and harbor improvements (also aided in the U.S.) and for terminal facilities as well. In France and Belgium these are national subsidies. In West Germany and the Netherlands they are provided locally. The U.K. requires public-owned ports to earn a 9 percent return on investment. It has also encouraged user-charge pricing of channels and navigation aids.[43]
4. Pricing freedom, particularly for rail services, is an area of volatile policy change differing considerably from country to country. At one extreme is Japan, where both rail freight and passenger rates are established by the Diet and promulgated by legislation.[44] The nationally-owned rail system in Australia has pricing freedom for freight, but attempts to obtain passenger fare increases have been prevented by state and national government.[45]
5. Many other countries have moved toward pricing freedom, even for nationalized rail systems, in order to permit greater opportunity for rail to respond to truck competition. In Canada, the National Transportation Act of 1967[46] liberalized and substantially deregulated rail ratemaking, with the significant exceptions of statutory rates set for grain movements in the prairie provinces and all rates in the maritime provinces. Because of the similarities in conditions between the United States and Canada, Canadian experience under the act provides an important source of information for both opponents and proponents of regulatory change in the U.S.

   The premise of the act is that sufficiently competitive conditions exist in Canada to permit almost complete pricing freedom by the railroads. The few rail pricing constraints that remain involve a 20-day advance notice for increases (none for decreases); a successful showing by a shipper that he is "captive" to rail services; a successful showing of a *prima facie* case of conflict with the public interest; and a prohibition on rates below variable costs.

   The treatment of "captive shippers" under section 278 of the Act differs considerably from U.S. approaches.[47] The criterion for captivity is the railroad's ability to charge rates many times higher than cost because of the lack of competitive forces, rather than the apparent lack of intermodal competition used to define dominance in U.S. regulatory practice. It is believed that shippers, particularly large shippers of bulk commodities, have sufficient market power to assure protection from monopoly pricing. Where a captive shipper condition exists (few cases have arisen) maximum rates are set by the Canadian Transportation Commission at 250 percent of variable cost. To obtain this rate ceiling, the shipper must commit all the affected traffic to rail for a one-year period.

The public interest constraint in the Canadian law reflects the continuing conflict between a policy based on assuring the efficiency of transportation in meeting demand and one that perceives transportation as a tool of social and regional development goals. Although the Act is fundamentally based on the former view, elements of the latter persist in the maintenance of statutory grain rates and subsidized rates for all goods moving by truck or rail to or from the economically depressed maritime provinces. The principle of government remuneration of required services extends to the maritime rates and to uneconomic branchlines and passenger services maintained for public benefit, but does not include compensation for the below-cost grain rates which account for 18 percent of all Canadian rail ton-miles and only 6 percent of revenue.[48]

The effects of Canadian deregulation have generally been successful, to date, in that negotiations between shippers and carriers have not resulted in monopoly rates, and the profitability of rail services has improved. Significantly, the greatest complaints have been received from those areas still protected by statutory rates.[49]

6. A factor of general importance related to pricing policy is government response to the cost recovery of government-mandated services. In Japan no provision is made for the remuneration to Japan National Railways of government-directed services.[50] In Canada, as pointed out above, the government pays for certain government-required service, which focuses attention on the cost consequences of service decisions.[51]
7. In Europe, the Common Market has played a significant role in codifying the nature of government support to transport. A process formalized by regulation in 1969 to 1970 set out common rules for the normalization of accounts for transport by surface modes, particularly rail. Those rules reach beyond simple normalization of accounts toward an attempt to normalize the context of competition among different transport modes. This procedure includes identification and classification of subsidies by purpose, reimbursement of costs generated by government actions beyond those required by proper "commercial management," and attempts to equalize infrastructure costs.[52]

Urban Transport

In urban transport, European and U.S. pricing and finance policies are becoming increasingly similar as regards extensive capital and operating subsidy of transit, and growing consideration of pricing and other policy actions to inhibit auto use in central cities. A major stimulus for such policies in Europe, not present in the U.S., is the desire to preserve medieval centers of cities which have street systems inappropriate to auto use. Europe and the U.S. share a concern for increasing transit subsidies and search for a transit support rationale. European policies include the following:

1. Substantial expense for transit subsidy in the U.K. prompted a reevaluation of previous support policies, leading to increased fares to reduce deficits.[53]
2. Since 1975, France has permitted cities of over 100,000 population to levy employment taxes of 1 to 2 percent on all employers with more than 10 employees. The receipts, equivalent to $500 million per year in the Paris region, are used to support transit investment and operating costs.[54]
3. Innovative fare systems, in general, have been a policy precept. These include monthly passes good for unlimited use on all transit facilities, e.g., the *carte orange* in Paris, hourly tickets good for unlimited use in a specific time period, as in Geneva, and "honor systems" without turnstiles or barriers, as in Hamburg and Geneva.[55]
4. In Canada direct national government support to urban transit is very recent. Previously, the extensive Canadian urban transit system received provincial and urban government support.[56]

A closely-followed pricing innovation has been the Singapore road-pricing project, in which entry into downtown by auto requires a special license purchasable for $25 per month. As might be expected, substantial shifts to transit and car pools have resulted for trips destined to the downtown, and through trips have been diverted around the central area onto bypass roads. While the project has been a success in its near-term goal of reducing auto use (with a decline of 70 percent in autos destined to downtown in the early morning peak), its long-term effects on broader goals, and its direct costs and benefits, have yet to be fully assessed.[57]

PLANNING AND INFORMATION

In Europe, planning for transportation is made part of overall planning. Overall economic and social planning occurs at the national level on a multi-year basis and comprehensive urban planning, encompassing transportation, takes place at the local level.

1. In the five-year development plans of both socialist and non-socialist countries, significant priority is often given to promoting development in lagging regions, stimulating exports and providing a minimum of mobility to all areas of the nation. In the Netherlands this process includes consideration of the transport support needs of the ports, although port planning itself is a matter of local responsibility.[58] In France it means stimulus to development of low-income regions of the nation.[59] Both Canadian and Japanese transport plans emphasize regional economic and population development away from existing coastal areas.[60] However, recent trends toward deregulation have shifted emphasis back to the commercial role of transport, deemphasizing the use of transport as a "tool" of other policies. The high cost of subsidizing transport has been a major cause of this policy shift.[61]
2. In urban areas, all services are integrated in support of comprehensive government-implemented, land-use plans. In Hamburg, planning has led to an integrated transit authority which controls fares, services, schedules, and the distribution of revenues among service providers.[62] This policy of supporting land-use plans has resulted, in many cities, in controlled development of business and residential areas keyed to minimizing transport needs and environmental disruptions.

GOVERNMENT ORGANIZATION

There are both positive and negative lessons to be learned from the experience of other countries in government organization.

At the national level, most countries have cabinet-level agencies like the U.S. DOT. Often these agencies are more comprehensive, including water-related and regulatory functions found outside the U.S. DOT. Attempts to place transportation into super agencies, such as the Ministry of Environment in the U.K., have apparently proven unsuccessful. (The U.K. recently reestablished a separate Ministry of Transport.) In Europe and in developing nations, transportation is often linked with communications in a cabinet-level agency.[63]

In Japan, the Ministry of Transport is the product of an unusual organizational history. Each section of the Ministry is directly related to specific legislation, and little interaction or coordination occurs between units. A significant factor affecting the Ministry's effectiveness is that the highway-related activities of the national government are housed in the Ministry of Construction.[64]

A strong element of national organization and procedure in many countries, including the U.K., Belgium, the Netherlands, Japan, and the Federal Republic of Germany, is the extensive use of economic tools, such as multi-criteria and benefit-cost analysis in investment evaluation. Not only are analytical tools more extensively applied in these countries than in the U.S., they also aid transportation-wide and national-level decisionmaking.[65]

More extensive ownership of transport systems by national governments elsewhere has often led to very protective government policies seeking to sustain and support the investment. This has been particularly true with railroads and ports. In effect, governments have acquired an entrepreneurial interest and have sought to protect that interest not only by public investment, but by use of their regulatory powers. Results of such action have been mixed and, at least in the rail sector, some governments have reduced rail services and employment to counter deficits. Another consequence has been the evolution of public-enterprise management. Public enterprises are held more accountable for both service quality and fiscal results than parallel public operations in the U.S. They are often expected to make a profit, or break-even and show a reasonable rate of return on public investment. As a result, a quasi-public, quasi-private sector of transportation has developed, perhaps most analogous to U.S. port or turnpike authorities.[66]

At the local level, many different arrangements of national-local powers and responsibility exist. As a general rule, central governments bear a greater share of the burden of local investment and take a more direct role in the provision of local services and facilities than does the national government in the U.S. However, this is by no means universal. In Canada, national government involvement in local transit began only recently.[67] Truck regulation is a provincial matter, with the constraint that interprovincial and intraprovincial traffic must receive identical treatment.[68] In the Netherlands, the great ports have developed without direct aid from the national government. Similarly, in the Federal Republic of Germany, port investment is the role of the cities or landers.[69]

A feature of local transportation institutions in Europe is the apparent greater ability and willingness to experiment with innovative approaches to urban transportation problems. This willingness to experiment makes Europe a resource for American analysts to observe the successes and failures of new ideas. The greater autonomy and authority of local government officials may serve to explain this attribute of local policymaking. Also, the lack of funds for large-scale investment may have induced a flexible approach.[70]

DIFFERENCES IN GOALS AND OBJECTIVES

Many goals guiding policy formulation are shared by all countries, including those supporting general economic development of a nation, providing for national defense, assuring reasonable mobility to all as a matter of equity, and efficiently utilizing resources. However, the differences in weight given to certain goals tend to leave each country with a different policy perspective. Some of these differences are presented below.

In some countries, the government assumes a greater responsibility to provide a basic level of mobility to all citizens. The lower income levels of many nations, with a consequent dependence of large segments of their population on public transport, is a related factor. This focus on mobility via public transportation is manifest in support for urban transport and intercity ground transport services. In urban areas, there is a strong public role in providing extensive collective transport systems at prices that can be afforded by lower income groups. This practice results in substantial public subsidy. American policy perspectives on the role of urban transport have been moving in the same direction. In Europe, intercity transport is treated in a manner similar to the urban case; extensive rail services and complementary bus services (in areas unable to support rail) provide many specialized fares for the poor, the elderly, large families, and war veterans. There is a willingness to assure some public service even in the remotest areas, and policies are designed to shift auto and air demand onto public transport. In Scotland and Germany, the use of mail vehicles to provide post-bus service has extended at least a minimum of service to passengers in isolated areas.[71] Japan has legislated a "civil minimum" of transport service to rural populations.[72]

Policies affecting national freight systems are often formulated in the light of broad national interests. These interests include support of national trade policies, national employment goals and regional development objectives. National interests are frequently stated as very explicit objectives, and are manifested in financial, regulatory, and service policies.[73] Certainly the greater interdependence among close-by nations is a partial explanation for this difference, but not a complete one. Indications of this policy view are reflected in the aids for construction of rights-of-way, tax support, or freight-rate benefits in all modes given to certain regions of Sweden, Spain and France.[74]

Tourism plays a strong role in formulating national passenger and freight policies. This is clearly tied to the same sense of broad national interests identified above in terms of effects on freight system policies. Moreover, the travel activity of tourists represents a far greater share of total travel in many countries than in the U.S. Thus, it is not surprising that supply decisions are made with greater recognition of tourist needs. If foreign tourism continues to grow in the U.S., passenger service will certainly change to respond to that new sector of demand. U.S. policies regarding tourism do not include the relatively widespread European practice of accepting deficits in transport in order to obtain positive net benefits from tourism on the national scale.[75]

The perceived necessity to use transport policy to sustain or develop desired land-use patterns is greater in most other developed countries. This perspective clearly places goals internal to transport in a subordinate position to overall land use and development goals. It is most evident in cities where motorized vehicle use has been restricted or prohibited to protect areas of historic or cultural value. But it is also manifest on a nationwide basis, particularly in the smaller countries, in the evaluation of land-taking for transport right-of-way. There is a strong emphasis on policies that utilize existing capacity, particularly rail, or provide new capacity within existing transport corridors. Some countries have taken the further step of determining the location of production activities in ways that minimize resultant transport requirements.[76]

APPLICATIONS TO U.S. POLICY

This section discusses the domestic transportation policies of other nations, by transport market, and highlights their relevance to U.S. policies. A more exhaustive and detailed analysis of candidate policies could be required before adoption by the U.S.

THE URBAN MARKET

European urban transport policies have been successful, for the most part, in two interrelated areas: (1) providing pervasive transit service at reasonable cost; and (2) preservation of downtown areas. European transit can generally be described as superior to U.S. service in every city category.[77] Perhaps the most significant contribution to this success is the fact that policies toward transit support have been consistent since World War II. Thus, the present level of quality is a product of several decades of continuing investment providing incremental improvements over substantial periods of time. In contrast, the U.S. is currently in a period of readjustment and catching-up after decades of neglect of transit needs. The U.S. has been approaching transit on a massive project basis, similar to the large-scale perspective of the freeway-system-planning period of the fifties and sixties. This approach fails to recognize that all the great rail transit systems of the world, including those of the U.S., have been built in small segments over long periods of time, with additions made only as need was fully established. U.S. transit policy has just begun to recognize the value of this approach.[78]

Policies regarding transit finance and pricing have gone through several phases in parts of Europe. These phases are significant because they parallel the development of transit finance and pricing issues in the U.S. Many European cities and countries are beginning to move away from a policy that the U.S. is just moving toward in transit, i.e., a policy that sees transit as a utility, like police or fire protection, to be provided pervasively and financed by all taxpayers rather than by users or direct beneficiaries.[79] The application of this policy in the past helps explain the quality and scale of service available in many European systems today. The premises for such a policy perspective, particularly the view that the benefits of transit are of a broad-based, public-good nature going well beyond benefits to immediate users, have only recently been adopted in the U.S. As U.S. policy has moved strongly in this direction, often without careful identification and qualification of ostensible benefits, European policies have begun to swing back to a more modest set of expectations regarding transit benefits, and a more conservative perspective toward public expenditures for transit. Thus, today, moving from opposite points on the scale, U.S. and European policies have converged on a common point where farebox revenues pay about the same share of transit operating costs in all the major U.S. and European rail transit cities.[80] In London, after a few years in which transit fares had become a negligible part of revenues, policy shifted to a philosophy of full cost recovery from the farebox. This objective has not been achieved, but the direction of policy is toward fares that recover a greater share of costs.[81] The French employment tax to support local transit appears based on identifying employers as major beneficiaries of the transit system, and has much in common with the "value-capture" philosophy now prevalant in U.S. transit strategies. The area of coverage of such a tax (in terms of center city versus its suburban competition) and the jurisdictional boundary issues in many cities would have to be carefully evaluated. Such a policy might best go hand-in-hand with a related package of supportive public policies to help justify the expense to employers.

Financing and pricing policies for pervasive service relate to the other area of successful urban transport policy in Europe—the preservation of downtown areas. Americans concerned about downtown revitalization can learn from successes in other countries. European transit practices have supported downtown development goals, as have European policies controlling auto access to central areas. Heavy taxation of parking, with control of available spaces, has been central to the effectiveness of these policies. Diversion of autos and trucks away from protected areas has also been significant. The emerging area of U.S. urban transport policy labeled Transportation Systems Management (TSM) has borrowed strategies and programs from early European experience. However, U.S. policy, as exemplified by TSM regulations, has not incorporated two important elements of the European experience. First, the U.S. process has not integrated short-range TSM strategies into a long-range transport perspective, bringing the transportation role into the overall planning philosophy for the city and its non-transport goals. Second, U.S. experience has not overcome institutional and jurisdictional impediments to a comprehensive local policy framework that ensures the coordination and mutual support of investment policies, operating and regulatory policies, and development policies. In much of Europe, unlike the U.S., jurisdictional conflicts are not major roadblocks to concerted action.[82]

There have been significant failures in European urban policies that are also instructive. Some of these failures highlight potential weaknesses in U.S. policy.

In London, control of downtown parking without directly controlling the private sector was not successful. Over a period of 5 years, more than 30,000 parking spaces in publicly-owned garages were closed. The private sector responded by building more private garages, so that total spaces available downtown diminished only slightly. The London policy has now shifted to one of strong control of new facilities and taxation of existing spaces.[83]

In Sweden, attempts to retard auto-ownership by high auto fees, inexpensive transit and orientation to apartment living have not proven successful. Demand for single-family homes and for autos has continued to be strong despite considerable barriers. Emphasis has shifted to retarding second-car purchases and reducing auto use for downtown work trips.[84]

An area of weakness in urban policy has been failure to effectively control the development of rapidly growing cities. In general, Europe has not experienced the kinds of dramatic urban growth seen in some U.S. cities of the South and West. Where similar growth has occurred, European policies have not proven particularly more successful than U.S. approaches. New town policies have not succeeded in absorbing or channeling growth, nor has transit effectively guided development in suburban areas.[85] This reality identifies an area of policy weakness in Europe and America, as well as elsewhere in the world. The problems of rapid urban growth stemming from rural migration are universal, and have not been effectively ameliorated by public policies.

INTERCITY FREIGHT MARKET

Although some factors governing freight flows in the U.S. are considerably different from those of any individual country in Europe, or even the European continent as a whole, some policy issues are strikingly similar to those in the U.S.

The most important similarity in all countries relates to implicit (or sometimes explicit) policies promoting a desired modal split in intercity freight flows. Almost categorically, all European countries in recent years have decided that rail service is the "backbone" of their freight systems and that rail usage is to be supported. Correspondingly, movements by truck, which are growing everywhere, should be constrained so as to support rail. The reasons for this perspective vary widely, but energy and environmental factors are often cited. Economic efficiency, meaning considerably different things in different places, is also cited as a goal to be met by greater utilization of rail facilities. In countries where the rail system is nationalized, part of the rationale is to protect public assets and to avoid large public expenditures for a higher-capacity highway system. The Economic Commission for Europe has identified the efficient utilization of existing system capacity as a major goal behind national modal policies, which tend to favor greater rail utilization. Part of the rationale is linked to a mutually reinforcing set of policies favoring rail for intercity passenger service.[86]

Recognizing these modal-split goals helps explain many of the attendant policies toward the individual freight modes. Many European nations have arrived at the conclusion that the heaviest trucks impose costs on the road system in excess of their payments in road-user fees, even when these fees increase sharply with vehicle weight. Changes in fee schedules to compensate for this disparity are under development in most countries.[87] As in the U.S., efforts to arrive at an appropriate allocation of highway costs are hampered by the lack of adequate research. In recent surveys, only the Swiss government felt it had adequate road-cost data by truck-size category to make definitive taxation decisions.[88] The unique Swiss geography makes the transferability of these studies questionable. The clear trend in policies is to increase the already high user fees imposed on vehicles.[89] In addition to taxation, West Germany and other countries have used controls on total truck capacity to constrain trucking growth.[90] The British control flows by sharply limiting truck access to many roads, even though a large share of British trucking is nationalized.[91] Truck size and weight questions have not been as major a set of issues as could be expected in Europe, given the considerable differences in permissible dimensions from country to country.[92]

Railroad nationalization *per se* has not mitigated the necessity in many countries for rationalization of over-developed systems and operating staffs. A second phase of policies to support rail by regulatory constraints on the competitors to rail, particularly trucking, has also failed to ensure the economic viability of national rail systems. Substantial pressures everywhere to reduce rail subsidies have produced a third phase of policy, increasing the commercial freedom of railroads. The most significant aspects of this phase, in terms of U.S. interests, are programs for increasing rate-setting freedom, freedom to contract for services and freedom from some common carrier responsibilities. Deregulation of rail rates has been paralleled in many countries by truck rate deregulation, which has had the effect of shifting trucking flows from private to common carrier trucking.[93]

A major stimulus to freight rate and subsidy rationalization has been provided by the Common Market. Its influence has been substantial in developing a "rationalization of accounts" system. In this process, the cost accounting framework includes the identification of direct and indirect support to transportation, as a possible first step toward eventual reduction. The international trade ramifications of internal transport subsidies is the major factor creating pressure for reform within the EEC. The goals of this reform policy are equalization of the starting point in transport competition, and more freedom to compete in transport services. The EEC has also harmonized national truck safety policies on driver operating hours and vehicle utilization.[94]

Thus far, port regulation and subsidy have not been major focal points of common policy. The diversity of roles played by national and local government and private interests in European ports is dramatic. Valuable lessons can be learned from the very breadth of approaches taken. A test case for any potential U.S. port policy could be found somewhere in the European port policy array. One area where there is considerable uniformity of purpose has been in national support of port development. Almost all nations support ports by direct financial aid, or, where local governments are the source of aid, national support occurs through provision of responsive regulatory policies or necessary connecting transportation services.[95] A similar statement could be made for policies toward shipbuilding and ocean trade. A great diversity of goals and policies, successes and failures is exhibited in European maritime experience. The major applicable lesson from this experience seems to be the relative superiority of indirect forms of shipping support, compared to direct construction and operating subsidies. In Europe, the direct subsidies appear to reward and support higher costs.[96]

A final pertinent aspect of national policies that should not be lost to U.S. consideration is the strong integration of freight policies into national development and social policies in almost all European nations, including those with and without planned economies. National goals such as increased exports, balanced national growth and enhanced regional development of backward areas serve to guide and motivate transport policies. Such goals have rarely been directly incorporated in U.S. national policy considerations.[97]

A note regarding policy failures is significant as a closing perspective on European freight policies. Despite a common mode-split goal, and a broad and potent array of policies aimed at supporting rail and retarding the growth of trucking, European countries, at least to date, have failed to arrest the growth of the trucking share of freight movement. This is attributable to numerous factors, including changing industry locations, and a changing mix of industrial production to which trucking service characteristics are more responsive.[98] Significantly, this is true even in planned economies where extensive and draconian policies are implemented in support of rail. In market economies, these policies have often tended to undermine the vitality of market forces and private enterprise without achieving their modal goals.

INTERCITY PASSENGER MARKET

Policies parallel to those in the intercity freight case exist for intercity passenger transport in the European community. Most countries on the continent have adopted rail as the preferred mode of travel for all but the longest intercity passenger trips. Policy has evolved to support rail use and to constrain highway and air travel growth. The most significant of the specific constraints are the heavy gasoline taxes imposed on highway vehicles and the prohibition of competing bus services whenever rail service exists.[99]

These European policies have relevance to current U.S. transportation issues. The integration of rail and bus services is particularly noteworthy. These services are rarely permitted to compete directly on an individual route; rather, intercity bus service is treated as a feeder to rail service and as a line-haul mode where demand is insufficient to support rail service.[100] Were integrated management of the U.S. intercity bus and rail systems to exist, it might lead to the same philosophy in many markets. Intercity rail service is also heavily integrated in service design, fare structure, and physical structure with local urban transport systems.[101] Failure to integrate intercity modes, and to integrate intercity with urban services, is a weakness in current U.S. systems planning.

A final significant aspect of intercity passenger travel policy is the greater recognition in European countries of intercity travel as a personal mobility "right." Programs to provide basic services to disadvantaged populations in the U.S. have not extended to intercity travel. Far greater concern is focused in Europe on assuring linkage of isolated areas with the intercity system, and providing special fares to permit low-income persons to obtain the benefits of intercity travel. In this regard, foreign policies also more specifically demarcate business travel from social-recreational travel, establishing different services and fare structures for each.[102] The U.S. air system, under the new deregulation environment, is moving toward this kind of service and pricing strategy by private decision, rather than government fiat.

In review of these policies, it must be noted that there has been considerable foreign success in regard to secondary goals: for example, rail transit service is effective and heavily utilized. In terms of primary goals, however, other countries have been less successful. Despite preventive policies, a shift of population and employment from cities to the suburbs has occurred in Europe, as in the U.S. This migration has reduced the attractiveness of center-city oriented rail service, and has supported the expansion of auto use.

SUMMARY AND CONCLUSIONS

The four chapters in this section have summarized the present state of transportation in the U.S. today. The physical transport system and the ways in which it is used have been described. The private and public institutions participating in transportation activities have been identified. The Federal, state and local systems of policymaking were presented, with important policies and policy gaps considered. These presentations are supported by extensive compilations of existing government policies and programs for all transportation modes and markets. The final chapter of the section presents those domestic transportation policies of other developed countries relevant to U.S. policy concerns.

Together the chapters of this section provide a comprehensive statement of the facilities, activities, participants, policies, and issues that constitute the national transportation system today. The next section sets out the NTPSC's forecasts to the year 2000, as a further basis for the development of new policies.

NOTES AND REFERENCES

1. For example, the Energy Policy and Conservation Act of 1975, 42 U.S.C. Section 6201 *et seq.* (1977), set U.S. fuel economy standards for new autos ranging from 18 mpg for 1978 models to 27.5 mpg for 1985 cars. But by 1975 the European auto fleet had attained a fuel consumption average equivalent to the 1985 U.S. standard. The U.S. sought changes in technology to achieve fuel economy but European fuel economies were based on a combination of technology and complementary public policies, suggesting that fuel savings objectives could be achieved without substantial impairment to mobility and other goals. See Alan E. Pisarski and Niels De Terra, "American and European Transportation Responses to the 1973–74 Oil Embargo," *Transportation* 4 (1975), pp. 291–312.
2. *Ibid.*, p. 310.
3. World Bank, *Relieving Traffic Congestion: The Singapore Area License Scheme,* Staff Working Paper No. 281, Washington, D.C.: 1978. (Hereafter cited as *Singapore Area License Scheme.*)
4. U.S. Department of Transportation, Office of the Assistant Secretary for Policy and International Affairs, "Report to the Secretary Re: Bilateral U.S./Swedish Energy Research Opportunities Based on Meetings with the Swedish Transport Commission, Swedish Energy Forecasting Committee, and the Swedish Transport Research Commission," unpublished staff memorandum prepared by Alan E. Pisarski, Washington, D.C.: May 1974.
5. They are more extensively treated in NTPSC, *Papers on Selected Transport Policies of Developed Countries,* Report No. NTPSC/SR-79/05 Washington, D.C.: January 1979. (Hereafter cited as *Selected Transport Policies.*)
6. C. Kenneth Orski, "Urban Transportation in Europe," in *Selected Transport Policies.*
7. See discussion of common carrier obligation in James R. Nelson, "Surface Freight Transportation in Europe," in *Selected Transport Policies.*
8. In Spain, Portugal, and Italy, over 50 percent of all rail passengers travel on discounted fares. Eligible groups include teachers, soldiers, government employees, veterans, and journalists. Ralph E. Rechel, consultant to Spanish State Railway and Portugese State Railway (circa 1963 to 1967), interview about potential World Bank modernization programs, Washington, D.C., January 1979.
9. The World Bank required the Spanish State Railway to cut 30,000 employees over a 10-year period as a condition of loans for capital investment for railway modernization—a condition the railway failed to meet. *Ibid.*
10. See, for example, the description of the Leber Plan by Kenneth D. Boyer, "West Germany: Search for *Marktordung,*" in *Foreign Regulatory Experiments: Implications for U.S.: An Analysis and Evaluation of Foreign Transportation Regulatory Experience,* prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Policy and Program Development, ed. by James R. Nelson, Report No. FRA–OPPD–77–24, Washington, D.C.: Government Printing Office, 1977. (Hereafter cited as *Foreign Regulatory Experiments.*)
11. Jim Loveland, "Nationalization: Not the Attractive Answer Some Believe It to Be," *Southern Pacific Bulletin* 62 (May 1978), pp. 6–7.
12. *Ibid.*
13. *Ibid.* See study by Edward J. Lincoln, "Japan: Profitable *Shinkansen* and Deficit Freight," in *Foreign Regulatory Experiments, pp. 10–32.* Also based on communications with the author, 20 June 1978.
14. Motor Vehicle Manufacturers Association, *MVMA Motor Vehicle Facts & Figures '78,* Detroit, Michigan: n.d., p. 29.
15. See United Nations, Economic and Social Council, Economic Commission for Europe, Inland Transport Committee, Ad Hoc Meeting for Reviewing Transport Development Trends, *Replies from Governments on Concepts of Transport Policy with Regard to the Modal Split,* Doc. TRANS/AC.1/R.5/Add.1, (Geneva, Switzerland), 25 July 1978. (Hereafter cited as *Concepts of Transport Policy, Addendum* 1.)
16. United Kingdom, Department of Transport, Scottish Development Department, Welsh Office, *Transport Policy,* White Paper presented to Parliament, June 1977, London: Her Majesty's Stationery Office, 1977, pp. 21–23, 31–33.
17. World Bank, *The Economic Development of Spain: Report of a Mission Organized by the World Bank at the Request of the Government of Spain,* Baltimore, Md.: Johns Hopkins Press, 1963, p. 224.
18. Organization for Economic Cooperation and Development, *The Future of European Passenger Transport,* final report on the OECD study on European intercity passenger transport requirements, Vol. A, Paris: 1977, p. 69.
19. *Ibid.*, pp. 174–176.
20. *Ibid.*
21. *Ibid.*
22. See chapter by Theodore E. Keeler, "Regulation and Modal Market Shares in Long-Haul Freight Transport: A Statistical Comparison of Australia and the United States," in *Foreign Regulatory Experiments, pp. 9–1–9–44.* Also based on communications with the author, 20 June 1978.
23. James C. Nelson, "Great Britain: Decline and Fall of Surface Transport Regulation," *Foreign Regulatory Experiments,* pp. 3–30 to 3–34.
24. One of the first effects of the *Transport Act of 1968* (Great Britain, Transport Act, 1968, c. 73) was increased own-account (private) trucking, due to the new freedom of private carriers to fill empty back-hauls for hire. But this trend soon reversed and, since 1970, for-hire trucking has grown continuously, while private carriage has actually declined in tons and ton-miles. *Ibid.*, pp. 3–41 to 3–43.
25. See U.N., *Concepts of Transport Policy, Addendum* 1, and J. R. Nelson, "Surface Freight Transportation in Europe," in *Selected Transport Policies.*
26. Orski, "Urban Transportation in Europe."
27. *Ibid.*
28. *Ibid.*, and see case studies of five European and two Asian cities provided by the Organization for Economic Cooperation and Development, Environment Committee, in *Proceedings of an O.E.C.D. Conference: Better Towns with Less Traffic,* held April 14–16, 1975, Paris: 1975.
29. U.K., Transport Policy, pp. 42–43.
30. OECD, *The Future of European Passenger Transport,* pp. 100–104.
31. J. R. Nelson, "Surface Freight Transportation in Europe," *Selected Transport Policies.*
32. See Lincoln, "Japan: Profitable *Shinkansen* and Deficit Freight." Also based on communications with the author, 20 June 1978.
33. OECD, *The Future of European Passenger Transport,* p. 351.
34. *Ibid.*, p. 100.
35. J. R. Nelson, "Surface Freight Transportation in Europe," in *Selected Transport Policies.*
36. The following government statements cover truck payments in relation to infrastructure cost. Their relevance to the U.S. situation depends on the extent to which highway construction and maintenance practices in Europe compare with those in the U.S., and the extent to which similar axle and gross-weight loadings occur.

Switzerland. The Swiss government articulated this problem in a reply to a UN-sponsored survey of transport development trends: "In particular, a federal inquiry has revealed that the taxes paid by lorries and drawing-vehicle-and-trailer assemblies do not cover the cost of the wear-and-tear on infrastructures that is attributable to those vehicles. In addition, injury to the environment (pollution, noise) and the encroachment of roads on land earmarked for other purposes are causing increasing concern; there is a growing resistance in public opinion to what is called 'covering Switzerland with concrete' ('le betonnage de la Suisse')." See U.N., *Concepts of Transport Policy, Addendum* 1, p. 7.

United Kingdom. Responding to the same survey, the U.K. government refers to possible remedial actions, as follows: "For road freight transport, the Government of the United Kingdom proposes to modify the vehicle taxation system to enable full account to be taken of vehicles' laden weight, and their resultant costs in environmental and road maintenance terms. The Government will also carry forward measures for civilising the heavy lorry, by supporting research into more efficient distribution systems, and by improving the standards of the vehicles themselves, in terms of safety, noise and pollution for instance." See United Nations, Economic and Social Council, Economic Commission for Europe, Inland Transport Committee, Ad Hoc Meeting for Reviewing Transport Development Trends, *Replies from Governments on Concepts of Transport Policy with Regard to the Modal Split,* Doc. TRANS/AC.1/R.5, (Geneva, Switzerland), 27 July 1978, p. 15. (Hereafter cited as *Concepts of Transport Policy.*)

A comprehensive government White Paper on *Transport Policy,* presented to Parliament in June 1977, included this perspective: "The Government will maintain the progress it is making to secure that the taxation on lorries covers their share of the public costs of roads, including the cost of policing them and of accidents. In 1976–77, transport taxes on goods vehicles as a whole just fell short of their costs, but taxes on certain of the heaviest lorries fell short by as much as 40 percent." (p. 40).

Australia. For a discussion of government taxation and subsidy policies towards highways, see Keeler, "Regulation and Modal Market Shares," pp. 9–9 to 9–16.

France. See J. R. Nelson, "France: *Dirigisme* and Its Difficulties," in *Foreign Regulatory Experiments,* pp. 4–55, 4–56.

Germany. See Boyer, "West Germany: Search for *Marktordung,*" pp. 6–46, 6–47.

37. Keeler, "Regulation and Modal Market Shares," p. 9–16.
38. See, for example, "Europeans Reduce Fares, Improve Food Services," *Aviation Week & Space Technology* 109 (9 October 1978), p. 30.
39. U.K., British Railways Board, *Annual Report and Accounts 1977,* Westerham Kent, England: Westerham Press, Ltd., 1977, p. 5. In response to an NTPSC inquiry, the U.K. Department of Transportation has indicated that ". . . if a loss is incurred by British Rail in 1978, the government will not make up the deficit." (Telex received from Meg Wilson, 21 February 1979.)
40. Great Britain, Laws, Statutes, etc., Railways Act, 1974, ch. 48, s. 8. Also, see U.N., *Concepts of Transport Policy.*
41. Lincoln, "Japan: Profitable *Shinkansen* and Deficit Freight," pp. 10–17. Also based on communications with the author, 20 June 1978.
42. United Nations, Economic and Social Council, Economic Commission for Europe, Inland Transport Committee, *Important Trends in Transport Developments and Transport Policy,* Doc. TRANS/R.45, (Geneva, Switzerland), 26 November 1976. (Hereafter cited as *U. N. Trends in Transport.*)
43. See John L. Hazard, "National and State Roles in Port Development," in *Selected Transport Policies.*
44. Lincoln, "Japan: Profitable *Shinkansen* and Deficit Freight," pp. 10–20 to 10–21. Also based on communications with the author, 20 June 1978.
45. Keeler, "Regulation and Modal Market Shares," pp. 9–10. Also based on communications with the author.
46. Canada, Revised Statutes of Canada, *The National Transportation Act,* 1966–67, c. 69, s. 2.
47. See chapter by John R. Baldwin, "The Canadian Experience: Increased Rail Rate Freedom and Increased Subsidization as Successors to Rail Cross-Subsidization," in *Foreign Regulatory Experiments,* pp. 2–30 to 2–32.
48. T. D. Heaver and James C. Nelson, *Railway Pricing Under Commercial Freedom: The Canadian Experience,* Vancouver, Canada: Center for Transportation Studies, University of British Columbia, 1977, pp. 77–78.
49. *Ibid.,* pp. 331–340.
50. Lincoln, "Japan: Profitable *Shinkansen* and Deficit Freight," pp. 10–25 to 10–26. Also based on communications with the author, 20 June 1978.
51. Baldwin, "The Canadian Experience," pp. 2–31.
52. J. R. Nelson, "Surface Freight Transportation in Europe," in *Selected Transport Policies.*
53. See, for example, U.K., *Transport Policy,* pp. 28–29.
54. Orski, "Urban Transportation in Europe," in *Selected Transport Policies.*
55. *Ibid.*
56. A. Bach, "Canadian Directions for Urban Transportation Policy," presented at the Annual Meeting of American Society of Civil Engineers, July 1974, Ottawa, Canada: Ministry of Transport, 1974, pp. 8–9.
57. World Bank, *Singapore Area License Scheme.*
58. Hazard, "National and State Roles in Port Development."
59. J. R. Nelson, "Surface Freight Transportation in Europe," in *Selected Transport Policies.*
60. OECD, *The Future of European Passenger Transport,* p. 351. Baldwin, "The Canadian Experience," pp. 2–34. Also based on communications with the author.
61. J. R. Nelson, "Surface Freight Transportation in Europe," in *Selected Transport Policies.*
62. Orski, "Urban Transportation in Europe," in *Selected Transport Policies.*
63. For example, the governments of Ecuador, Thailand, Indonesia, Belgium, Finland, and Sweden.
64. Lincoln, "Japan: Profitable *Shinkansen* and Deficit Freight," pp. 10–16. Also based on communications with the author, 20 June 1978.
65. U.N., *Trends in Transport.*
66. John L. Hazard, "National Transportation Policy Administration (Transitional Lessons from Home and Abroad)," *Transportation Journal* 16 (Summer 1977), pp. 5–19.
67. Bach, "Canadian Directions for Urban Transportation Policy," presented at the Annual Meeting of American Society of Civil Engineers, July 1974, Ottawa, Canada: Ministry of Transport, 1974, pp. 8–9.
68. T. D. Heaver and James C. Nelson, *Railway Pricing Under Commercial Freedom: The Canadian Experience,* Vancouver, Canada: Center for Transportation Studies, University of British Columbia, 1977, p. 190.
69. Hazard, "National and State Roles in Port Development," in *Selected Transport Policies.*
70. See, for example, Orski, "Urban Transportation in Europe," in *Selected Transport Policies,* pp. 2, 9.
71. U.K., *Transport Policy,* p. 31.
72. Lincoln, "Japan: Profitable *Shinkansen* and Deficit Freight." Also based on communications with the author, 20 June 1978.
73. U.N., *Trends in Transport.*

74. *Ibid.*
75. The entire industry of international Inclusive Tour Charters, which often feature reduced air fares, is a direct outgrowth of this approach.
76. See U.N., *Trends in Transport.* Note particularly replies of the U.S.S.R. and Czechoslovakia.
77. The availability in Europe of extensive transport services in smaller cities (below 250,000, or even 100,000 population) contrasts sharply with the U.S. where, until recently, transit services in such sized cities were almost non-existent. For extensive discussion of the difference in services, see OECD, *Proceedings of an OECD Conference: Better Towns with Less Traffic,* and United Nations, Transportation and the Cities, report on the Second Seminar on the Role of Transportation in Urban Planning, Development, and Environment, held June 13–19, 1976, Washington, D.C.: National League of Cities, 1977.
78. Orski, "Urban Transportation in Europe," in *Selected Transport Policies.*
79. See, for example, U.K., *Transport Policy.*
80. Orski, "Urban Transportation in Europe," in *Selected Transport Policies.*
81. U.K., *Transport Policy,* pp. 28–29.
82. *Ibid.*, pp. 18–22.
83. U.K., *Transport Policy,* pp. 26–28.
84. DOT, "Report to the Secretary Re: Bilateral U.S./Swedish Energy Research Opportunities."
85. See U.N., *Transportation and the Cities.*
86. See, for example, C. Kenneth Orski, "European Intercity Passenger Transportation," in *Selected Transport Policies.*
87. See commentary and references in Note #36.
88. *Ibid.*
89. *Ibid.* Also see discussion of EEC policies in J. R. Nelson, "Surface Freight Transportation in Europe," in *Selected Transport Policies.*
90. See J. R. Nelson, "France: *Dirigisme* and Its Difficulties," pp. 4–31, and Boyer, "West Germany: Search for *Marktordung,*" pp. 6–24.
91. U.K., *Transport Policy,* pp. 42–43.
92. In most countries, considerably greater weights are permitted than in the U.S. (which allows a maximum gross weight for the Interstate System of 80,000 pounds, subject to state approval, with single- and tandem-axle maximums of 20,000 and 32,000 pounds. Representative gross weights in Europe (in pounds) are: U.K., 71,663; France, 83,790; Germany, 83,790; Netherlands, 110,250. Canada permits from 76,000 to 126,000; Japan permits 44,100 to 74,970. See equivalent, metric-ton figures in International Road Federation, *Limits of Motor Vehicle Sizes and Weights,* Doc. IRF No. 7700, Geneva, Switzerland and Washington, D.C.: 1977, pp. 4, 6.
93. J. C. Nelson, "Great Britain: Decline and Fall of Surface Transport Regulation," pp. 41–43.
94. J. R. Nelson, "Surface Freight Transportation in Europe," in *Selected Transport Policies.*
95. Hazard, "National and State Roles in Port Development," in *Selected Transport Policies.*
96. See concluding observations of John L. Hazard, "Relevant Maritime Policies of Other Countries," in *Selected Transport Policies.*
97. U.N., *Trends in Transport.*
98. U.N., *Concepts of Transport Policy.*
99. OECD, *The Future of European Passenger Transport,* p. 70.
100. Orski, "European Intercity Passenger Transportation," in *Selected Transport Policies.*
101. *Ibid.*
102. See discussion of system design alternatives in OECD, *The Future of European Passenger Transport,* p. 333.

Forecasts to the Year 2000

II

General Social and Economic Forecasts to the Year 2000

5

INTRODUCTION

Transportation demand is influenced by the demographic and geographic distribution of the population; types of transportation service and the state of technology currently available; energy supply conditions; the supply of capital, land and labor; and the relative cost of transportation compared to other goods and services.

This chapter describes the general framework used by the NTPSC to project some basic socio-economic conditions through the year 2000, focusing on growth and distribution of the population and gross national product. These projections used three alternative sets of socio-economic conditions. For each set, detailed internal consistency checks as well as external comparisons with other studies were made.[1] This chapter alone does not represent a definitive statement by the NTPSC on future transportation needs and resources; rather, it is an introduction to a series of chapters which collectively presents transportation forecasts. Expected technological change to the year 2000 is outlined in Chapter 6; Chapter 7 takes up externalities that influence the transportation forecasts and evaluates the significance of environmental and safety mandates to the transportation activity of the future. Patterns of energy supply, availability and use are covered in Chapter 8. Resultant transportation activity forecasts are described in Chapter 9. Chapter 10 deals with capital requirements for the transport forecasts. Finally, Chapter 11 presents estimates of the relative price of transportation to the year 2000 and the expected government expenditures for transportation purposes.

RESEARCH APPROACH

In predicting the course of key social and economic trends, there are two realistic options. One employs a macroeconomic model, based on time-tested interrelationships between social and economic factors. Macroeconomic models forecast the short-run paths of economic variables and can be used to derive information about potential transportation activity. But formal models allow little flexibility for the simulation of unprecedented events, because they hold relationships between variables constant over time. A second option is to describe alternative future scenarios, using a combination of socio-economic factors that is believed to affect transportation activity. The strength of this approach lies in its ability to allow for unprecedented or unexpected future events.

A dual approach using scenarios and macroeconomic models was chosen by the NTPSC. Scenarios were postulated as a means of bracketing a range of realistic futures. Three scenarios were developed, termed: (1) low growth; (2) medium growth; and (3) high growth. Those scenarios illustrate the general structure of the U.S. economy and the broad nature of its society between now and the year 2000. Alternative scenario values were developed for 18 selected socio-economic factors. Scenario values then became input to a formal macroeconomic model, termed Inforum, and other transportation and energy models linked to Inforum.

Inforum is an input-output model. The scenario values, for such variables as population, gross national product (GNP), disposable personal income, government expenditures, and labor productivity, were part of the input used by the Inforum model to forecast final demands, disaggregated by industrial components. The output was sales in constant dollars for 200 sectors of the U.S. economy and employment for 96 sectors.

Although such energy commodities as coal, crude oil, and petroleum products were among the goods whose sales were forecast, those forecasts were replaced by other estimates of the SRI, International National Energy Model (NEM). The NEM used price-quantity relationships (demand curves) and produced market-clearing quantities and prices of fuels. It yielded data on production quantities, flows of fuels through transmission links, and capacities of the conversion processes. Moreover, NEM encompassed alternative technologies and fuels with their costs of production, which permitted the output results to vary with changes in the prices of alternative energy supplies. The NEM results included disaggregations for 11 domestic supply regions and imports;

it yielded estimates of consumption in 9 U.S. Census regions for 22 end-uses.

In addition to Inforum and the NEM, other models or techniques were used in forecasting transportation measures to the year 2000. The full list, with the purpose of each technique, follows.

1. An auto fleet process simulated changes in the stock of vehicles due to aging and the addition of cars. It produced estimates of numbers of vehicles, vehicle-miles traveled (VMT), gasoline consumption and other related values. The process did not provide information about vans or light-duty trucks.
2. TRANS, a transportation submodel to Inforum, calculated national results, involving 48 commodity classes, on performance of the transportation modes: railroads; maritime trade; domestic waterborne commerce; for-hire trucking; air carriers; pipelines; local transit; intercity buses; transportation services and warehousing; private trucking; private autos; private ships; general aviation; and private buses.
3. A regionalization process was used, employing data on population, 1975 commodity flows, plus forecasts of population and industrial activity by Bureau of Economic Analysis (BEA) zone, to divide GNP and activity forecasts into regions.
4. A National Transportation Planning model (NTP) had inputs such as time and cost per person-mile or ton-mile of transport and forecast passenger and commodity flows between BEA zones for 17 commodities.
5. For the urban market, a model using population, freeway miles, area, bus fleet size, transit fares and parking charges was applied to forecast highway speed, transit load factors, fatalities, and benefit-cost ratios of investment by investment class. That urban model dealt with 6 city-size groups, recognizing that cities of different sizes are heterogeneous.
6. An international air process used forecasts of passengers and tons to calculate passengers and traffic leaving and entering the U.S. plus the number of aircraft operations necessary to accommodate the freight and passengers.
7. An international maritime process used scenario parameters and produced estimates of the value of imports and exports by direction (east, west and south). The process used a forecasting package with a fleet-forecasting model. The results are port-specific and commodity-specific.
8. Rural passenger travel was estimated using information on population in rural areas and the VMT per capita results of the urban model (number 5, above).
9. Urban and rural freight movement by motor carriage was estimated as a function of GNP.

These models and processes interacted in a unified way to create the forecasts presented in Chapter 9. For example, Inforum was used to forecast the production of selected commodities, and this was allocated to regions. The NTP was used to determine which mode would convey each commodity from its origin to its destination. Coal traffic was assigned to individual routes and those routings checked to identify overloaded or underutilized links.

The NTPSC's technology surveys, presented in the next chapter, were employed as inputs to models to change some parameters, such as increasing fuel efficiency figures in the auto and airline sectors.

KEY ECONOMIC AND SOCIAL TRENDS

The remainder of this chapter presents the more outstanding trends that are evidenced by the NTPSC's three scenarios. Those scenario trends are depicted in Table 10.

Demographic and lifestyle trends, as shown in the table, concern population and labor force size and distribution among regions, ages, and sexes. These trends influence the aggregate demand for transportation, the demand for particular modes, and the distribution of demand by place and time. Economic and financial trends affect the conditions for development of new transportation infrastructure. Social factors depict elements of lifestyle that can determine patterns of mobility and the propensity to travel. Technological trends emphasize innovation and resource use which influence transport demand and supply. Potential, realistic trends in all these areas were estimated for each of the three alternative scenarios developed by the NTPSC.

DEMOGRAPHY AND LIFESTYLE

The past two decades have witnessed significant changes in lifestyle, social values, work ethic, and leisure and recreation trends. Although most of these changes may not be quantitatively measured, their impact has already been felt on the economy. The rising marriage age and divorce rate have combined to produce a smaller percent of married people and a greater number of individual households. Significantly greater labor participation rates among women have motivated increasing demands for employment, often for part-time or flexible-hours jobs. They have resulted in greater real earned income per household, and greater pressure on transportation for journey-to-work trips. Longer life expectancy and increased economic independence for the elderly have multiplied the number of elderly households. These trends are expected to continue over the near-term future. Also expected are increases in the number of service and professional employees, changed distri-

TABLE 10. NTPSC scenario components and trends

Scenario Components	Scenario Trends Low-Growth	Medium-Growth	High-Growth
Demography and Lifestyle	Low population growth Continued migration to South and West Regions Urban consolidation to conserve resources Work-ethic replaced by rise of avocational interests Restrained lifestyles	Moderate population growth Increased migration to South and West regions Central city revitalization Voluntarily frugal, yet satisfying, lifestyles	Low population growth Highest migration to South and West regions Significant increase in recreation and leisure Thriving unconstrained urban environment
Economic Factors	Low economic growth Low capital formation Moderate to high unemployment	Moderate economic growth Healthy capital formation Moderate unemployment	Rapid economic growth Rapid capital formation spurred by liberal government tax policy for business Full employment
Resources and Technology	Limited exploitation of domestic resources Restrained technology in accordance with low growth	Balanced resource exploitation Efficiency stressed in adoption of new technologies	Full exploitation of domestic resources enhanced by technical break-throughs Technology spurred by private investment is a prime mover
Government	Substantial influence in successful adoption of low-growth policies Income redistribution through tax policy Ameliorative social welfare focus	Major governmental role in planned growth Significant federal social welfare programs	Limited government influence in all sectors Strong, autonomous free enterprise system Government relief for less-affluent classes
International Posture	U.S. withdraws from global leadership	U.S. is a stabilizing international influence	U.S. is dominant power in the free world

bution of U.S. incomes, and increased business-related travel.

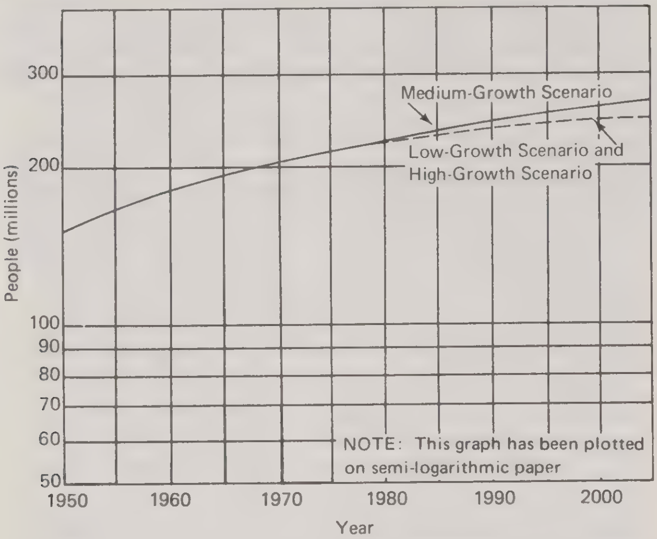
Significant increases in crime and vandalism, especially in cities, have affected some downtown commercial and entertainment areas, contributed to residential flight from urban areas and substantially increased the costs of providing some services. A rise in incidents of political and social terrorism has forced governments and private business to increase their expenditures for safeguards. These trends are expected to decline, but may remain a problem in the low-growth scenario.

POPULATION

U.S. population has increased over the last few decades, while fundamental demographic changes have been taking place. The economy has already felt these changes. The population is older on the average. Aging of the "baby boom" cohorts, a lower fertility rate and longer life expectancy portend an increase in the median age from 29 years in 1975[2] to an estimated 39 by 2005. The economy has just begun to feel the far-ranging effects of accommodating the "baby boom"—the burst of children born in the post-war era, which continued into the early 1960s. The last decade, on the other hand, has witnessed a sharp decline in the fertility rate[3] from 3.8 in the mid-1950s to 1.7 by 1976;[4] this rate is expected to fluctuate in the 1.7 to 2.1 range through the year 2000. The medium scenario assumes the higher 2.1 fertility rate; the low and high scenarios assume the 1.7 rate.

The household formation rate is expected to continue growing faster than population growth, although at a reduced rate from the past decade's experience. Therefore, more but smaller households will exist, totaling between 90 and 109 million in the year 2005, an increase of 23 to 50 percent above the 1976 level. All factors considered, population is expected to total between 248 and 267 million by the year 2005, an increase of 15 to 24 percent over the 1976 total. (See Figure 5 for depiction of the population projections adopted by the NTPSC.) Most of those who will be mature workers, pensioners or consuming adults in the U.S. in the next 21 years are already born. Although those being born between now and 2000 will contribute to the dependent population, constrain the older population's pocketbooks and lifestyles, and generate transportation demand attributable to their own needs, the growth of younger cohorts will slow from what it has been over the

FIGURE 5. U.S. population projections, by scenario, to 2005.



NOTE: This graph has been plotted on semi-logarithmic paper

SOURCE OF HISTORICAL DATA: U.S. Department of Commerce, Bureau of the Census, *Current Population Reports,* Series P–25, No. 704 (Washington, D.C.: U.S. Government Printing Office, July 1977), Table 1, p. 21.

SOURCE OF PROJECTIONS: U.S. Department of Commerce, Bureau of the Census, *Current Population Reports,* Series P–25, No. 704 (Washington, D.C.: U.S. Government Printing Office, July 1977), Table 2 and 3, pp. 23–74. (The medium scenario corresponds to Series II projections which assume a fertility rate of 2.1. The low and high scenarios correspond to Series III projections which assume a fertility rate of 1.7.)

past few decades. Appendix Table 10 lists assumptions, trends, and transportation implications regarding population for the three scenarios.

Population migration from rural to urban areas is expected to continue, with urban areas continuously expanding, though the recent trend of non-SMSA growth exceeding urban-area growth may continue.[5] The predominance of non-SMSA growth has been witnessed only since 1970 and, in fact, represents a reversal of the trend in the previous five-year period.[6] More evidence is needed to discern the future direction of this trend. Population distribution assumptions are given by scenario in Appendix Tables 11, 12 and 13 for the several regions of the country.

SMSA growth is expected to increase in the South and West as people migrate from the Northeast and North Central regions. Shifts of population and industry into the South and West, witnessed since 1970, are expected to accelerate due to the availability of land, natural resources, energy, a skilled labor force and social amenities. Appendix Figures 2, 3 and 4 describe urban area population as a percent of total population for the several regions of the country. While population growth in the South and West is expected to occur at 4 to 6 percent annually over the period, growth in the population living in urban areas in these regions will likely be somewhat slower. Appendix Figure 4 and Appendix Table 13 depict redistribution assumptions from the Northeast and North Central regions to the South and West.

LABOR FORCE

The labor force is expected to total between 121 million and 139 million by the year 2005, representing a 25 to 43 percent increase over 1976.[7] Over the next decade a labor surplus should develop, with unemployment gradually dropping afterwards as the rear guard of the baby boom generation enters its mature working years. Productivity should increase for the short-term, to 1985, reflecting a more experienced work force. By the mid-1980s, as the subsequent "baby bust" generation enters the work force, relative labor scarcity will replace relative labor surplus. The effects of this gap will be felt even more strongly post-2000 when the baby boom generation reaches retirement age and requires support by subsequent, smaller generations.

The total labor force participation rate is expected to bracket the present 62 percent participation rate,[8] ranging from 60 to 64 percent among the three scenarios. This may result in the participation rate approaching a plateau. However, the NTPSC forecasts that participation by women and young people will continue to increase, although at a reduced rate.

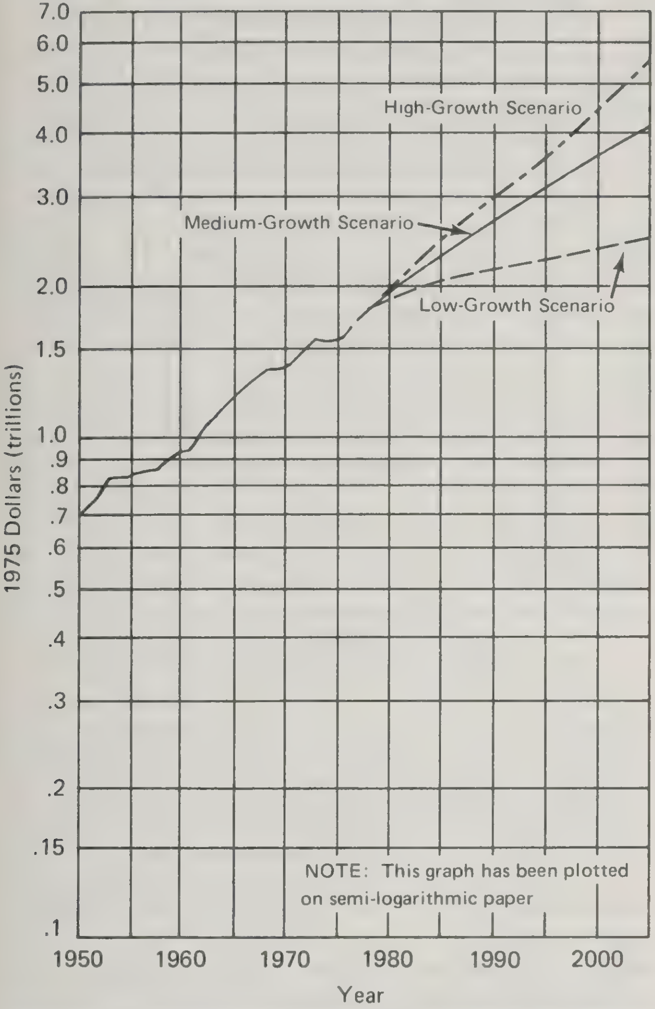
ECONOMIC FACTORS

The rate of growth in the economy's output represents an important influence affecting transportation demand and supply. GNP represents the dollar value of the nation's production of goods and services. "Real GNP" represents the same production, but valued at the prices of a chosen valuation year.

It was instructive to examine a range of potential GNP values and their effects on transportation activity. The NTPSC used GNP growth rates ranging from a high of a sustained 4 to 5 percent annual average growth in real terms to the year 2000 (the high-growth scenario), to a low of less than 1 percent annual average growth to 2000 (the low-growth scenario). The third scenario (medium growth) falls between the two extremes and somewhat parallels the post-World War II economic performance. Each scenario has a set of business and economic conditions, though similar structural economic trends are pervasive across all. See Figure 6 and Table 11.

The recent shift in the U.S. economy away from a manufacturing base toward greater consumption of services is expected to continue in all scenarios, though more rapidly in a high-growth economy. Important among these services are recreational amenities, which involve increased personal travel. Final

FIGURE 6. U.S. gross national product in constant 1975 dollars, projected to 2005.[a]



SOURCE OF HISTORICAL DATA: U.S. Bureau of Economic Analysis, *Business Statistics 1975* (Washington, D.C.: U.S. Government Printing Office, May 1976), p. 1; *Survey of Current Business*, Vol. 57, No. 3 (August 1977), p. S–1.

SOURCE OF PROJECTIONS: Estimates developed for the NTPSC by The Futures Group, Glastonbury, Connecticut, 1978.

[a]Adjusted by implicit price deflator for GNP.

TABLE 11. U.S. gross national product assumptions, by scenario.

Scenario		
Low	Medium	High
GNP growth declines from 4.89%[a] in 1978 to under 1% in the 1990s Slow productivity improvement Limited capital investment Shortages of critical raw materials Low levels of technological development Higher inflation	GNP growth moderate and comparable to history at 3%[b] over the period Improved productivity Moderate rates of capital investment and technological development Stable inflation rates Improved resource allocation	GNP growth high in the 4 to 5% range Much improved productivity Expansive capital investment Technological innovation and high levels of R&D Full exploitation of domestic resources

[a]U.S. Council of Economic Advisors, *Economic Report of the President*, Government Printing Office: Washington, D.C., January 1979, p. 184. (Updated to units of constant 1975 dollars.)

[b]U.S. Bureau of Economic Analysis, *Business Statistics 1975*, Government Printing Office: Washington, D.C., May 1976, p. 1; *Survey of Current Business*, 57 (August 1977), p. S–1.

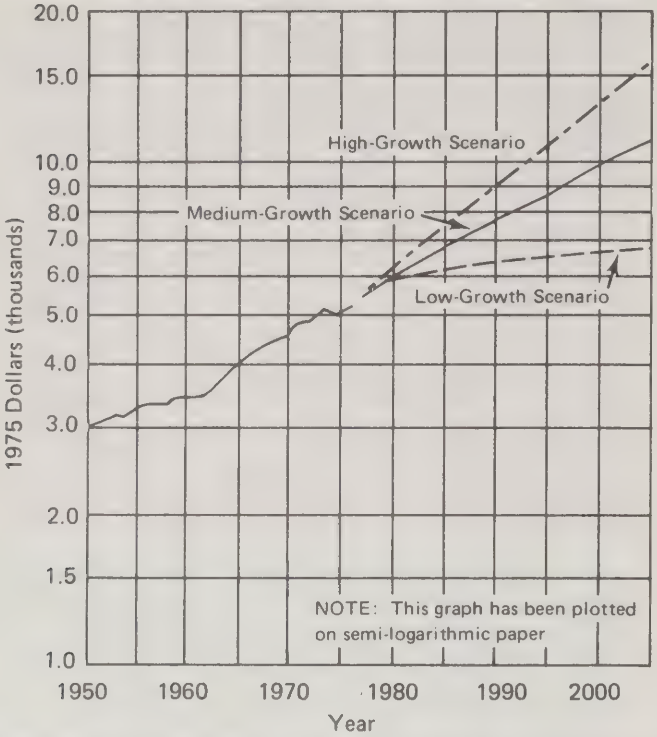
sales of goods as a percent of total final sales are expected to decline to about 43 percent in 2005 from 45 percent in 1976 and 48 percent in 1950.[9] The geographic shift of industry away from the Northeast and North Central regions to the South and West is also expected to continue, paralleling the rate of economic growth.

Growth in individual real income is a measure of change in the consumer's ability to purchase goods and services. Individual real earned income is expected to grow in direct proportion to the macroeconomic growth of the entire economy. Real GNP per capita may lie between a low of $9,500 and a high of $18,200 by the year 2000, versus $7,500 in 1976,[10] depending upon the growth rate of the economy. Individual purchasing power is likely to grow in proportion to real earned income, save for changes in taxation. Disposable personal income is a more precise measure of what consumers will actually have to spend. Future values of per capita disposable personal income may lie between $6,700 and $13,100 by the year 2000, versus $5,200 in 1976.[11] See Figure 7 and Appendix Table 14.

Growth in labor productivity, or change in output per employee-hour, is a critical influence on the rate of economic growth. In turn, influences on productivity such as technology, the capital-per-worker ratio, efficient resource use and labor quality are all interrelated and depend upon the macroeconomic performance of the economy. Labor productivity is expected to achieve a sustained annual average growth rate of about 4 percent under the high-growth scenario, and decline to less than 1 percent under the low-growth scenario.

Private domestic investment in plant, equipment, research and development is another factor intertwined with the growth of the economy. A proxy for this form of private sector spending is the trend in business non-residential fixed investment, as depicted in Figure 8 and Appendix Table 15. Private decisions about investment will depend on future expectations of the rates of return to capital and of inflation.

FIGURE 7. U.S. disposable personal income per capita in constant 1975 dollars, 1950 to 2005.[a]



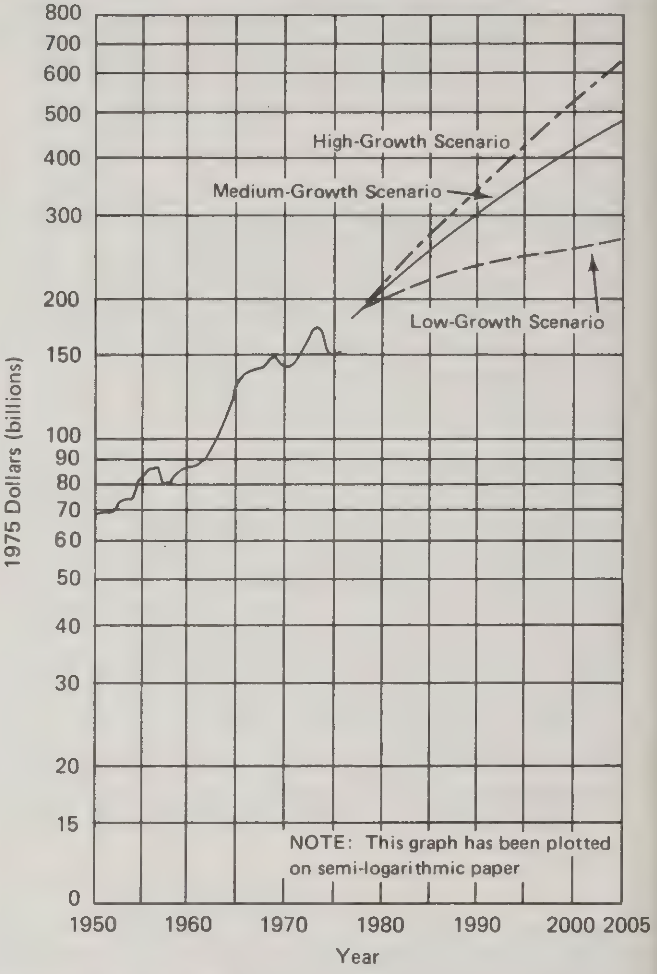
NOTE: This graph has been plotted on semi-logarithmic paper

SOURCE OF HISTORICAL DATA: U.S. Bureau of Economic Analysis, *Business Statistics 1975* (Washington, D.C.: U.S. Government Printing Office, May 1976), p. 8; *Survey of Current Business*, Vol. 57, No. 3 (August 1977), p. S–1.

SOURCE OF PROJECTIONS: Estimates developed for the NTPSC by The Futures Group, Glastonbury, Connecticut, 1978.

[a]Adjusted by implicit price deflator for personal consumption expenditures.

FIGURE 8. U.S. nonresidential fixed investment, 1950 to 2005.[a]



NOTE: This graph has been plotted on semi-logarithmic paper

SOURCE OF HISTORICAL DATA: The Economic Report of the President (January 1977), Table 3–2, p. 188.

SOURCE OF PROJECTIONS: Estimates for the NTPSC developed by The Futures Group, Glastonbury, Connecticut, 1978.

[a]Adjusted by the implicit price deflator for nonresidential fixed investment.

The NTPSC described the long-term trend in investment rather than short-term cyclical fluctuations. The rates of real return to capital are assumed to range from 2.5 to 3 percent, and average sustained rates of inflation over the period to be from 4 to 6 percent. These expectations will produce approximate bond yields for AAA corporate bonds of 6 to 9 percent by the year 2005, compared to 8.5 percent in 1976 and about 10 to 11 percent in 1979.[12]

GOVERNMENT

Under each scenario of economic conditions, government spending has a different profile. Total government spending as a percent of GNP is expected to range from 38 to 50 percent in the year 2005 among the scenarios, versus 34 percent in 1976.[13] Yet the composition of this government spending differs radically with the performance of the private economy. In a low-growth economy, transfer payments by governments to individuals in the form of unemployment and welfare benefits are expected to be a large component of government spending. In a high-growth economy, government purchases of goods and services or Federal grants-in-aid to state and local governments might be the largest expenditures. Federal expenditures are expected to represent the most quickly expanding portion of total government spending. Under any set of economic conditions, social security retirement benefits are expected to be a significant share of Federal expenditures by the year 2000.

IMPLICATIONS OF THE TRENDS FOR TRANSPORTATION

Expected social and economic trends will have various direct and indirect effects on future transport activity. Although population size changes have had considerable impact in the past they will have only minor effects to 1985 on transportation.

Transport activity clearly will be affected by the aging of the present population. Much of the baby boom generation will have passed through its mature working years by the year 2000. Because of this influx, the most rapidly increasing element of the population to 1990 will be 25 to 44 years old, which is traditionally the most employable and productive age group with the highest spending profile. This implies that leisure and business travel can be expected to increase substantially and then fall off sharply as the subsequent baby bust generation reaches the 25 to 44 age cohort in the early 1990s. Also, as a result of population age redistribution, there will be a major increase in high-travel-propensity age groups. The decline in the number of young drivers is expected to improve safety.

Although the relationship of freight demand to total population growth is complex, it is expected that the movement of the baby boom generation through the high-consumption age groups will increase overall demand for goods and freight transport.

Growth in the number of households will put increased pressure on auto ownership in particular, and trip-making for the journey to work, leisure, shopping and services delivery in general. The distribution of this new demand, and the effect on particular modes, will depend on the geographic dispersion of the new households and of the transportation network presently serving those areas.

Migration of population and employment toward the South and West will require readjustment of travel and intercity freight-flow patterns (particularly for consumer goods) in proportion to population and employment shifts. Revised intercity business-travel patterns will also result. Significant population shifts will affect the transportation facilities left behind as well as tax those in growth areas. The urgency of building new passenger and freight transportation facilities in growth areas not presently served by adequate facilities will depend on the rapidity of interregional population and employment shifts.

Continued urbanization of the population will require some readjustment of rural and urban freight-flow patterns as urban areas expand faster than central cities grow. In fact, many central cities may continue to lose population. Continued suburbanization of residences around SMSA fringes should serve to increase average journey-to-work and shopping trip lengths, but there exists potential for decline in these average trip lengths according to the pattern of employment suburbanization. On balance, this urban structure favors the use of the auto compared with traditional fixed-route transit. All of these urbanization patterns will be more pronounced in the South and West.

Transportation demand for journey-to-work trips should grow in proportion to total labor force growth, slightly reduced by combined journey-to-work trips per single household and, perhaps, the use of communication as a substitute for transport.

The macroeconomic performance of the economy affects investment levels and inflation rates, which directly influence transport activity. Projections of real GNP and real disposable personal income per capita suggest changes in the purchasing power of the consumer over time. It is believed that individuals realizing more disposable income will tend to increase their shopping trips and leisure travel, change their modal-choice patterns, and perhaps move further outside older cities to outer-SMSA suburban developments.

Private domestic investment to 2000 is expected to affect transportation by supporting a share of research and development and much of the growth in transport productivity. Government spending over the period may provide the same type of support for research and innovation in transportation and, more broadly, is anticipated to stimulate private investment. Selective business and government investment may favor one or more of the modes, for either passenger or freight, inducing greater technological innovation and labor productivity in that sector.

Changes in life styles, values and institutions affect transportation activity indirectly, for the most part, by causing changes in the rate of household formation, the relative mobility of selected classes and ages, the labor force profile, purchasing power of consumers, and urbanization or regional migration. Increased rates of crime and vandalism and growing incidents of terrorism impact transportation demand and supply. High rates of crime in certain areas undoubtedly affect demand for some passenger modes—urban bus and transit systems, for example. Vandalism and terrorism have already, in the air mode for instance, significantly affected the manner and cost of providing transportation services.

NOTES AND REFERENCES

1. Details concerning consistency and method can be found in Appendix II.
2. Brian Berry and Donald Dahmann, *Population Redistribution in the United States in the 1970s*, Washington, D.C.: National Academy of Sciences, 1977, p. 6.
3. Fertility rates are expressed as the average number of lifetime births per woman. The U.S. replacement rate is estimated at 2.1.
4. George Sternlieb and James Hughes, *Current Population Trends in the United States*, New Brunswick, New Jersey: The Center for Urban Policy Research, 1978, p. 12.
5. The term "urban area," as defined by the U.S. Bureau of the

Census, basically comprises all persons living in places of 2,500 inhabitants or more, or living in the densely settled fringes of urbanized areas. Urbanized areas are basically those places consisting of population of at least 50,000 persons. See U.S. Department of Commerce, Bureau of the Census, *1970 Census Users' Guide, Part I,* Washington, D.C.: U.S. Government Printing Office, October 1970, p. 82.

6. Brian Berry and Donald Dahmann, *Population Redistribution in the United States in the 1970s,* Washington, D.C.: National Academy of Sciences, 1977, p. 7.
7. U.S. Department of Labor and U.S. Department of Health, Education and Welfare, *Employment and Training Report of the President,* Washington, D. C.: Government Printing Office, 1977, Table A–1, p. 135.
8. *Ibid.,* and U.S. Bureau of Labor Statistics, *Employment and Earnings,* Vol. 23, No. 3, September 1976, Table A–1, p. 19.
9. U.S. Council of Economic Advisors, *Economic Report of the President,* Washington, D.C.: Government Printing Office, 1977, Table B–7, p. 195.
10. GNP: U.S. Bureau of Economic Analysis, *Business Statistics, 1975,* Washington, D.C.: Government Printing Office, May 1976, p. 1; *Survey of Current Business,* Vol. 57, No. 8, August 1977, p. S–1; Total U.S. Population: U.S. Bureau of the Census, *Current Population Reports,* Series P–25, No. 632, July 1976, Table 7, pp. 14–16.
11. U.S. Bureau of Economic Analysis, *Business Statistics, 1975,* Washington, D.C.: Government Printing Office, May 1976, p. 8; *Survey of Current Business,* Vol. 57, No. 8, August 1977, p. S–1.
12. U.S. Council of Economic Advisors, *Economic Report of the President,* Washington, D.C.: Government Printing Office, 1977, pp. 260–261. It should be noted that yields of industrial bonds rated AAA by Moody's have risen substantially since 1976. For example, in May 1979 a sample of six such new bond issues was quoted at nominal annual yields ranging from 9.73% to 11.18% *(Wall Street Journal,* May 7, 1979, p. 3l).
13. Total government expenditures: U.S. Bureau of Economic Analysis, *Survey of Current Business,* Vol. 56, No. 1, January 1976, Part II, Table 3.2, pp. 52–53, and Table 3.4, pp. 58–59; Vol. 57, No. 8, August 1977, Table 13, p. 9; GNP: U.S. Bureau of Economic Analysis, *Business Statistics, 1975,* Washington, D.C.: Government Printing Office, May 1976, p. 1; *Survey of Current Business,* Vol. 57, No. 7, August 1977, Table 1, p. S. 1–1.

Technological Trends in Transportation and Communications

6

INTRODUCTION

For a complete picture of the future U.S. transportation system, it is necessary to examine possible technological advances that may alter transport characteristics. In the past, improvements in transport technology were so frequent that they are difficult to catalog. Continued evolution has been the norm in the highway, waterway, rail, maritime, transit, and pipeline sectors since the turn of the century, and a new mode—air transportation—has emerged. In addition, telecommunications is of growing importance for the transport of data and information and may affect present transportation demand patterns; thus communications technology too is considered in this chapter.[1] Whether technological changes in transportation and communications will continue at a rapid pace, and how change might influence transport policy determinations, are important uncertainties. The primary objective of this chapter is to help resolve uncertainty by identifying potential technological innovations which may have significant impact on transportation by the year 2000. Because the range of opportunity for technological change is broad, embracing innovation in hardware, design concepts, system processes and better use of existing technology, the NTPSC sought the viewpoints of numerous industry and government transportation and communications experts. From an initial list of several hundred possible changes, 21 were selected for detailed investigation. To these 21 transport innovations were added potential new developments in communications which could significantly impact transportation. In Figure 9 these innovations are displayed according to mode.

For each innovation, a literature search was conducted to determine: technical descriptions; probable effects and costs; major barriers to implementation; a likely introduction date; and, where possible, an estimate of market penetration through the year 2000. A similar analysis was made for telecommunications technologies. This chapter describes the factors that motivate innovation, reports the findings of the NTPSC's investigation and concludes with an assessment of the net effect on transportation associated with each innovation.

MOTIVATING FORCES

Technological innovation will no doubt continue to be spurred by traditional motivations and market forces—to reduce capital and operating cost, improve service, meet consumer demands, and expand markets. But there are new forces of government regulation that influence change and help determine which innovations emerge. In some cases, government influences are peripheral to traditional transportation goals, and reflect national goals in other fields.

There is public concern in such fields as: safety; environmental protection; energy conservation; mobility for the elderly, handicapped, and poor; national security; enhanced economic welfare; and a variety of other matters. In pursuit of varied ends, government influences the nature of technological development in several ways:

1. Specific regulations are imposed that foster or inhibit technological change, e.g., automobile energy efficiency and emissions standards;
2. Direct government support of research and development, and indirect government support through tax policies, may lessen the risk and quicken the rate of technological innovation, e.g., electric vehicles; and
3. Technological spinoff from other Federal efforts, especially national defense and space exploration, may occur, e.g., civilian aircraft have benefited from innovations developed for military purposes.

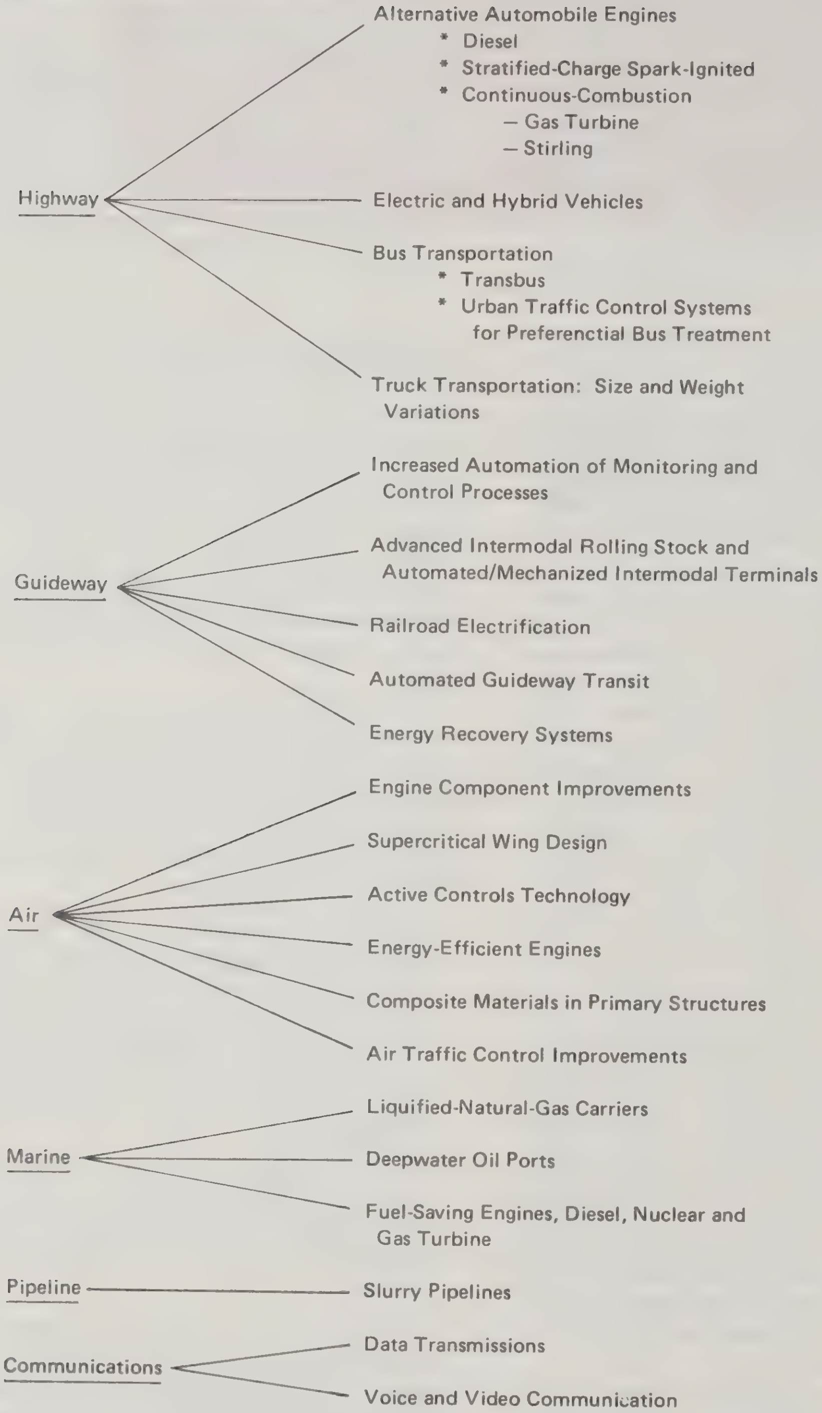
Both traditional market motivations for the transportation industry and its suppliers, plus motivations produced by government pursuit of various national goals, are likely to influence the nature of technological innovation in transportation during the remainder of the century.

TECHNOLOGY FINDINGS

AUTOMOBILE TRANSPORTATION

During the 1970s, the Federal government became a major force influencing automobile technology, and

FIGURE 9. Key innovations selected for analysis.


Highway
Alternative Automobile Engines
* Diesel
* Stratified-Charge Spark-Ignited
* Continuous-Combustion
— Gas Turbine
— Stirling
Electric and Hybrid Vehicles
Bus Transportation
* Transbus
* Urban Traffic Control Systems for Preferencial Bus Treatment
Truck Transportation: Size and Weight Variations
Guideway
Increased Automation of Monitoring and Control Processes
Advanced Intermodal Rolling Stock and Automated/Mechanized Intermodal Terminals
Railroad Electrification
Automated Guideway Transit
Energy Recovery Systems
Air
Engine Component Improvements
Supercritical Wing Design
Active Controls Technology
Energy-Efficient Engines
Composite Materials in Primary Structures
Air Traffic Control Improvements
Marine
Liquified-Natural-Gas Carriers
Deepwater Oil Ports
Fuel-Saving Engines, Diesel, Nuclear and Gas Turbine
Pipeline
Slurry Pipelines
Communications
Data Transmissions
Voice and Video Communication

government influence is expected to be strong to the year 2000. Autos accounted for over 90 percent of total passenger miles traveled in recent years,[2] so it is not surprising that the auto is a prime target for government efforts to conserve petroleum, reduce air pollution and improve travel safety.

The 1975 Energy Policy and Conservation Act (EPCA) and its amendments set average fuel economy standards weighted by sales for new cars; those standards rise from 18 mpg in 1978 to 27.5 mpg in 1985.[3] To meet EPCA objectives, auto industry research can be expected to focus on innovations which increase fuel economy, such as engine modifications or alternative engines, drag reduction, and greater use of lightweight materials in vehicles.

The 1977 Clean Air Act Amendments set strict standards that are to be met in the early 1980s for new car emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen.[4] Future standards may include other classes of emissions. These standards affect the development of both alternative engines and alternative fuels.

In the area of safety, pressure from both the government and consumer groups is likely to continue to promote structural changes that improve crashworthiness and further the incorporation of passive and active restraint systems and accident avoidance systems.

Aside from government directive, the profit motive continues as an incentive for automobile innovation. Domestic producers, wishing to maintain their competitive positions, will advance innovations which reduce vehicle maintenance, improve reliability and enhance comfort. A market expansion opportunity which is being watched closely is the small urban auto; the likely candidate is an electric or hybrid vehicle.

Automobiles will require extensive modification to reach the objectives established for fuel economy and emissions. Many vehicle components will be subject to change, especially engines. With improvements such as electronic fuel metering, fuel injection, and three-way catalysts, today's standard—the uniform-charge, spark-ignited engine—may continue to be preferred. This engine has a 60-year history of manufacturing and maintenance experience. However, without drastic size and weight reduction, vehicles equipped with these engines will be unable to meet 1985 EPCA standards.[5] Likely alternatives for the early 1980s include the stratified-charge, spark-ignition engine and the diesel. In the late 1980s, other alternatives may be available, such as gas turbine and Stirling engines, plus electric or hybrid propulsion systems. These four types of alternative engines for the 1980s were chosen for further investigation.[6]

Diesel Engine

The diesel has held only a small fraction of the total engine market for autos, taxis, and light trucks, but diesels are increasingly viewed as a practical means of building profitable cars while meeting current regulations on emissions and offering a 25 to 30 percent mileage improvement over comparable gas engines.[7] General Motors Corporation has made a considerable commitment to automotive diesels, as have several foreign automakers.

Despite good fuel economy, durability, and low maintenance characteristics, the future of the automotive diesel is tightly linked to its emission characteristics. Because of impurities in diesel fuel oil, diesels emit more oxides of nitrogen (NO_x) than current gasoline engines.[8] While diesels can meet current NO_x standards of 2.0 grams per mile, it is generally agreed that the economically practical lower limit for a diesel, using current emissions-control technology, is 1.0 gram per mile for a full-size car.[9] Such a level of emissions will enable diesels to meet 1981 standards, but not the 1977 Clean Air Act Amendments goal of 0.4 grams per mile.[10]

Another factor weighing against the diesel is its high level of particulate emission.[11] Health effects of these particulates are currently not well defined. The only method known for reducing particulates is filtration or trapping and such devices require frequent service. Thus, further developments in particulate control systems could be needed if emissions regulations are established for particulates.

Stratified-Charge, Spark-Ignition Engine

This engine is similar to the uniform-charge, spark-ignition engine now commonly used, except the fuel-to-air mixture in the combustion chamber is much richer near the spark plug than elsewhere, permitting lower peak temperatures, higher compression ratios, and more complete combustion. The result is better fuel economy and reduced emission levels, benefits which make stratified charge technology an attractive near-term addition to the basic spark-ignited engine.

One version of this engine was introduced into the domestic market in 1973—the Honda CVCC (compound vortex-controlled combustion) engine. This design is available only in relatively small four-cylinder engines. It is uncertain whether the CVCC's fuel efficiency and emission characteristics will remain favorable in larger engines.[12] Another version, the Ford Motors PROCO (programmed combustion) engine, is in the developmental stage. Its open-chamber design may offer more potential for solving the dual problems of emissions and fuel economy in larger engines.[13]

Continuous-Combustion Engines: Gas Turbine and Stirling

Two continuous-combustion engines, the gas turbine and the Stirling, are long-term candidates for alternative auto engines. Both engines are characterized by a process in which a fuel is burned continuously. In the gas turbine engine, compressed, heated air rotates a turbine which drives the propulsion chain.

In the automotive version of the Stirling engine, a gas such as hydrogen or helium is sealed in pistons and alternately heated and cooled to produce work.

These engines are attractive on several counts. They both are potentially more efficient than spark-ignited engines and neither is constrained by the emissions characteristic of the diesel. Too, both engines can tolerate a wide range of fuel types and qualities, as opposed to the strict requirements of the spark-ignited and diesel engines.[14]

Prototypes of the gas turbine and the Stirling engines have been built, and research and development programs are underway. With Department of Energy (DOE) support, the Chrysler Corporation is investigating the gas turbine engine.[15] Until 1978, Ford conducted a DOE-supported research and development program on the Stirling, but now Ford focuses its research on the stratified-charge engine. However, Stirling research is expected to continue under DOE auspices.[16] In addition all auto manufacturers conduct extensive, independent engine research.

Widespread utilization of these continuous-combustion engines cannot occur without several engineering developments. The gas turbine engine will work most efficiently if a continuously variable transmission can be developed. Because the turbine rotates at a constant speed, the engine will have poor fuel economy at low speeds and idle unless it is equipped with such a transmission. Developers of the Stirling engine face the challenge of sealing the working gas in the pistons for mass production application. Too, an efficient Stirling awaits the development of alloys for use in certain engine components required to withstand extremely high temperatures. These engineering hurdles alone are expected to delay introduction of either engine until after the mid-1980s.[17] If these problems are surmounted, others remain, including enormous capital and development costs, market risk, and the need to develop new maintenance capability.

Electric and Hybrid Vehicles

There has been growing emphasis on electric vehicles in the U.S. The Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976[18] authorized a federally funded program to promote electric and hybrid vehicle technology and to demonstrate the commercial feasibility of these vehicles. Even without Federal backing, some 2,000 electric vehicles reportedly have been built and offered for sale in the U.S.[19] Hybrid vehicles which are powered by a combination of electric motors and internal combustion engines are not yet commercially available.

Interest in electric and hybrid vehicles is based on the following expectations:

1. Electric or hybrid vehicles would successfully compete with conventional vehicles in the urban market;
2. The net effect of using electric-powered vehicles would be a reduction in petroleum demand;
3. If batteries are charged during periods of low electricity demand (i.e., night), utility peak-power requirements would not be affected and electric generation could become more efficient; and
4. Environmental protection would be facilitated because it is easier to control emissions from a few stationary electric power stations than from a large number of moving vehicles.[20]

The extent to which these expectations are met hinges primarily on battery development. The battery is the main constraint on the ability of electric or hybrid vehicles to compete with liquid-fuel vehicles, although other extensive vehicle system and infrastructure modifications would be required.

In the near term, three batteries, lead-acid, nickel-iron, and nickel-zinc, have a reasonable chance of becoming commercially available. Promising advanced batteries are the lithium-metal sulfide, sodium-sulfur, and zinc-chloride.[21] At present, none of these batteries possesses the power, endurance or conversion efficiency which would enable battery-powered vehicles to match the performance of conventional autos.

Due to their limited range and acceleration, near-term applications of electric vehicles are likely to be confined to a few commercial vehicles for urban use, and special-purpose markets such as golf carts. Electric and hybrid vehicles are not expected to be common as second family cars until the 1990s at the earliest. The extent of market penetration through 2000 is uncertain and depends heavily on the rate of battery development and government incentives for commercialization.

BUS TRANSPORTATION

Traditional market incentives are expected to be important forces for innovation in bus technology. Strategies which increase energy efficiency will not be nearly as significant for buses as for other modes. However, energy conservation technologies developed for autos and trucks may be adapted for buses if cost savings are foreseen.

Transbus

In the urban market, a recent force behind technological change is the Federal government. Section

504 of the Rehabilitation Act of 1973[22] has been interpreted as requiring all transit projects receiving Federal funds to be accessible to persons in wheelchairs.[23] In response to the act, Federal design specifications for all new buses purchased with Federal aid after September 1979 require low floors and either ramps or lifts for wheelchairs.[24] It is hoped that this type of bus, called Transbus, can increase the ease and speed of entry and exit for certain passengers. The effect on time spent at each stop is unknown because introducing the Transbus may alter the ridership composition. Manufacturers expect these design changes to increase manufacturing costs by up to $30,000 per bus, and they may affect operating costs as well.[25] A barrier to widespread availability of Transbus in the near future has been reluctance on the part of bus manufacturers to change from their own designs to the mandated design.

Urban Transportation Control Systems for Preferential Bus Treatment

New emphasis on traffic engineering techniques which are non-capital-intensive and readily applied to improve existing transportation services has focused attention on applications to urban bus networks. A possible application is an Urban Traffic Control System (UTCS), developed by DOT, which can give buses preferential treatment at signalized intersections.

A UTCS consists of a set of signals at various network intersections that are computer-actuated to minimize traffic delays on the network. Existing UTCS systems detect traffic flows through buried detectors, then adjust traffic signals. When a system is designed for preferential bus treatment, on-board transmitters interact with detectors which recognize buses and activate a longer green signal. On bus routes with many signalized intersections, significant reductions in travel time plus some fuel savings are possible.[26]

UTCS systems can be implemented as part of an overall strategy to optimize traffic flows on a road network, including autos and trucks. Such a system could conceivably be designed to give preference to all high-occupancy vehicles, including vans and car pools. A UTCS system may be implemented rapidly compared with constructing new facilities and avoids the high capital costs, externalities and other difficulties associated with new construction. In urban areas with strong need for efficient transit, UTCS can have considerable market potential.

A barrier to UTCS is the resistance of bus operators to install on-board transmitters. Development of detectors that recognize the magnetic signatures of vehicles may eliminate this barrier. In addition, to the extent that granting preference to buses requires other motorists to suffer delays, there is likely to be opposition to UTCS.

TRUCK TRANSPORTATION

Technological innovations in trucking are expected to encompass: improvements in engines, drive-trains, and aerodynamic design; structural weight reduction; and increased dieselization.[27]

Government mandates to improve safety will motivate change in trucking. Innovation will be sought to improve crashworthiness, and accident avoidance systems similar to those under development for automobiles may become available for trucks.[28]

Increases in vehicle sizes and weights appear to be a major change in the physical characteristics of trucks and truck-tractor combinations which might occur over the next two decades. Truck sizes and weights were selected for further review in this report.[29]

Prior to 1956, the individual states had exclusive jurisdiction in the regulation of vehicle size and weight. However, following passage of the 1956 Federal-Aid Highway Act,[30] no Federal highway funds could be allocated to states which allowed vehicles to operate on the Interstate System with axle loads, gross vehicle weights, and widths greater than federally imposed limits.[31] However, if a state's limits prior to July 1956 were greater than Federal limits, the higher limits could be kept in effect by the state. (Federal limits apply only to the Interstate System and do not include height and trailer or combination length.)

Because vehicles of larger size or heavier weight can carry more cargo, and often be operated with less energy and at lower cost per ton-mile to the trucker, there is a continuing question as to whether size and weight restrictions ought to be increased. Several options are commonly considered for extending these limits.

1. Increase length while maintaining maximum gross weight limits. Such change would benefit the transport of light-density goods. However, significant increases in length pose concern to motorists.[32]
2. Increase gross-vehicle-weight limits but retain limits on the weight each axle can bear. Dependent on axle spacing (and the use of "bridge formulas") this would encourage the use of multiple axles or (if lengths also were increased) multiple trailers. Such proposals have been criticized on safety grounds and in light of potential negative impacts on structures and competing modes, especially rail.[33]

3. Increase axle-load and gross-weight limits. This would encourage heavier loadings. Greater axle loadings are expected to increase some highway maintenance and construction requirements.[34] For this reason and due to safety concerns, such proposals have considerable opposition.

An important consideration in any move to raise size and weight limits is the impact on other motorists. The question of who would bear the cost of any increased maintenance and any additional construction required with higher weights, and the potential safety problems with heavier and longer vehicles, are of particular concern to other motorists and to highway agencies. A final concern is a possible increase in motor vehicle freight traffic which might add to highway congestion and could reduce railroad haulage.[35]

RAIL GUIDEWAY TRANSPORTATION

Two facets of rail transport—long-haul freight carriage and urban transit—have potential for technological innovation. In rail freight, the search for profitability in a competitive environment is likely to spur operation and service innovations. Better utilization of existing equipment, more efficient use of labor and the introduction of new equipment, especially in the intermodal area, are targets for technological advances. However, implementing advances that require substantial investment requires overcoming the difficulties railroads face in raising capital. In urban rail transit, efforts to reduce costs have focused on innovations to decrease labor, energy, or capital construction costs.

Five guideway technologies were singled out for review. Three freight technologies are concerned with upgrading rail operations, saving energy and improving intermodal operation. Two urban guideway technologies were selected for examination; the first potentially improves service levels and reduces labor requirements in comparison with conventional transit, while the second may provide savings in electricity consumption.

Increased Automation of Monitoring and Control Processes

Railroads make extensive use of computers and other elements of automatic control systems. Additional use of sensors, detectors and computer hardware to monitor or control operations and provide information for management and planning could improve train scheduling, terminal operations and equipment utilization. A recent railroad industry application is the Train II program which monitors the flow of freight cars to provide information on car shortages and distribution.[36]

The amount of automatic control may increase, but major barriers must be overcome for the implementation of a national system, which could yield the greatest benefits. Expense will be a major barrier, and problems with obtaining uniform data quickly, fears of revealing proprietary information, and difficulties in enticing small but essential lines to join the network will impede the progress of the rail industry toward a full system.[37]

Advanced Intermodal Rolling Stock and Automated/Mechanized Intermodal Terminals

Technological developments are being pursued that will enhance the ability of railroads to move containerized freight. Service improvement is a primary goal of new rolling stock and terminal designs, and a factor of importance because rail container transport competes with trucks, which by and large offer superior service. Reducing costs by decreasing capital and operating expenses is also a goal. New, more efficient rail cars have been designed to serve specialized regional markets and as prototypes for a standardized car for the entire system.[38]

There are proposals for a variety of intermodal terminals aimed at reducing terminal delay. Less delay would improve service to shippers and cut costs through better equipment use. Some carriers favor expensive, automated terminals that can quickly and efficiently handle existing line-haul equipment.[39] Other terminal concepts require retrofitting or replacing existing equipment with designs that minimize handling at the terminal.[40]

Market applications for these intermodal concepts will depend on: resolution of conflicts about standardization of rolling stock; the level of demand for intermodal transport; the ability of the railroads to raise capital; solving outstanding technical problems; and the modification of existing union work rules.[41]

Railroad Electrification

Intercity rail fuel demands may be positively altered by increased track electrification.[42] While net energy savings from the switch may be small, railroad diesel-fuel consumption could be reduced if the 20,000 miles of highest-traffic-density routes (carrying about one-half of rail tonnage) were electrified. Petroleum equalling 1.5 to 2.0 billion gallons per year could be saved provided all utilities supplying the electric power relied on non-petroleum energy.[43] Change from dependence upon a scarce, expensive fuel—petroleum—to dependence upon a plentiful, relatively cheaper and domestic energy source—coal—could provide both transportation and non-transportation benefits. Nevertheless, electrification is highly capital intensive and would require huge levels of investment, in return for decreasing fuel and other operating costs.[44]

Automated Guideway Transit

Automated Guideway Transit (AGT) is a class of fixed guideway systems operating unmanned vehicles along an exclusive right-of-way. Shuttle-Loop Transit, the simplest system, operating in Morgantown, West Virginia, involves a loop with the vehicles stopping at every station. The most elaborate system, Personal Rapid Transit, consists of extensive, area-wide grids offering direct, personalized service. AGT systems are expected to provide efficient, speedy service while cutting capital outlays, compared with conventional subways. They may also reduce operating costs through labor savings, if outstanding technical and safety barriers are overcome.[45]

About $200 million, split nearly 50-50 between the private and public sectors, had been spent to 1975 on research and development in this area.[46] The most promising near-term application appears to be the deployment of simple AGT systems at airports and other high-density activity centers. However, five systems have been proposed for demonstration projects in urban areas under the auspices of UMTA's Downtown People Mover Demonstration Project.[47]

Energy Recovery Systems

Mass transit vehicles are attractive candidates for energy recovery through flywheel storage. During braking, energy is dissipated as waste heat; however, it can be stored in a rapidly rotating flywheel. During acceleration, this energy can be used to reduce the power drawn from a third rail. The frequent stops and starts characteristic of urban rail systems make flywheels particularly effective. One type of on-board flywheel has been tested on New York City rail cars and has reduced energy consumption per car by one-third over conventional equipment.[48] The Office of Technology Assessment estimated that if these energy reductions could be duplicated on all U.S. rail transit systems, 741 million kilowatt-hours would have been saved in 1974.[49] The significance of this savings is magnified because the maximum use of power by rail transit occurs at the same time as other peak electrical demands. The market potential for flywheel systems will be influenced by the price of electricity compared with the cost of flywheels, the number of new rail cars purchased, the number of new systems built and the feasibility of retrofitting existing cars.

AIR TRANSPORTATION

From its inception, air transport has been a rapidly changing, high-technology field. Government funding, particularly for defense, fostered many of the technological advances. Innovations in the civilian sector are motivated primarily by economic forces; changes which increase productivity, reduce operating costs, or enhance customer appeal have been incorporated into each new-generation aircraft. The chief means of improving efficiency has been to increase aircraft speed and capacity. But increasing speed became less cost-effective once jet fuel prices escalated in the mid-1970s. Fuel prices have emerged as a key force for technological innovation, which is expected to continue throughout the century, spurring innovations in engines, airframes, and flight control systems. To accelerate the development of fuel-saving innovations, the Federal government is sponsoring a massive research and development effort, the Aircraft Energy Efficiency Program.[50]

Even though fuel use has become a major concern to aircraft operators and designers, it is not the only factor anticipated to motivate future innovation. Maintenance cost reduction may receive more attention and safety should continue to be an important design parameter. Federal legislation is likely to require technological solutions to reduce aircraft noise and air pollutants. Deregulation of domestic air transport may focus attention on innovations in commuter aircraft[51] and air cargo.[52]

Several technological innovations were reviewed that are expected to have significant impact in air transport by the year 2000. For the six aircraft innovations covered, the anticipated total savings in fuel by the year 2000 compared with the base-case situation ranges from 32 to 40 percent.

Engine Component Improvements

The present commercial jet fleet is powered by a limited number of engine types. These turbofan engines[53] and their variants are expected to be produced for many years and remain in service well into the twenty-first century. Evolutionary improvements which reduce fuel consumption, maintenance, noise and emissions are likely to be incorporated into new production versions of these engines.[54] Component improvements to turbofan engines could alone result in a five percent increase in fuel efficiency,[55] a significant savings in view of the large number of these engines to be produced and operated in the future.

Supercritical Wing Design

Airfoil technology has improved considerably over the last decade because of rapid advances in computer-aided design techniques. As a result, new wing designs are available today which are superior to those of existing aircraft.[56] The use of a transonic or "supercritical" shape increases the stability of airflow over the wings, reducing drag and thereby saving fuel.[57] The amount of fuel saved depends on cruise speed and distance. The use of supercritical wings on current medium- and long-range wide-body aircraft could provide fuel savings of approximately five percent.[58] Fuel savings for short-range aircraft would be less. Other potential applications for this wing shape include general aviation and special-purpose aircraft, and helicopter rotors.

Active Controls Technology

The use of active controls on an aircraft's wings and tail can permit increased wingspan—with resulting drag reduction—and smaller tail areas—with corresponding aircraft weight reduction. Active controls operate by linking sensors on various aerodynamic surfaces to a computer that can automatically limit unwanted motion or stress on the aircraft structure. Estimates of reduction in fuel consumption are around five percent.[59] Such controls also improve ride quality in turbulent conditions.[60]

Energy-Efficient Engines

The next generation of turbofan engines is not likely to be in service until the 1990s.[61] The approach to that next-generation engine is expected to be through evolutionary improvement of current high-bypass-ratio turbofans, incorporating new materials and advanced components.[62] The National Aeronautics and Space Administration is funding much of the initial research leading to a new turbofan through its Energy Efficient Engine program.[63] The goal of that program is for 12 to 15 percent fuel savings compared to current high-bypass-ratio engines. Additional benefits of such a new engine include reductions in emissions and noise.[64] Two barriers exist which could delay introduction of the engine: the high capital costs associated with engine development; and the need for major innovations in manufacturing to make engine performance gains affordable.[65]

Composite Materials in Primary Structures

Strong, lightweight materials composed of fibers of boron or graphite arranged in epoxy or aluminum are now being tested in secondary airframe components.[66] Such composite materials could permit substantial weight reductions if used in primary aircraft structures such as the wings and tail. Design studies indicate that weight savings of 20 to 30 percent could be achieved with extensive use. Such savings would permit a 10 to 15 percent improvement in fuel efficiency over aircraft of conventional structure.[67] Extensive use is not expected until the 1990s because long-term flight experience is required to prove the reliability of composites. The cost of composite materials is high compared to aluminum, but costs are expected to fall with further manufacturing experience and scale economies are possible if the market for these materials expands.[68] Composite materials may also permit cost savings in aircraft assembly because of reductions in the number of required parts and fasteners.[69]

Composite materials can also be used in the general aviation sector. As one example, some helicopters now use composite rotor blades because the material permits aerodynamic blade shapes which are not practical in metal.[70]

Air Traffic Control Improvements

Technological changes may also occur in the Air Traffic Control System. Besides striving for improvements in the traditional areas of safety, navigation, and communication, emphasis seems likely to be placed on finding technological means to increase the capacity of existing airports. There has been little construction of new major airports while air traffic has continued to increase. At this time the technological solution with the greatest potential for increasing capacity appears to be reducing the minimum spacing required between aircraft during instrument approach and landing. It is anticipated that current spacing of 4 to 5 miles between large aircraft could safely be reduced to 2.5 miles, were there reliable systems to detect and avoid the hazardous wake vortices which trail large aircraft.[71] In addition to efforts to minimize turbulent wakes by aerodynamic changes in large aircraft,[72] the FAA is seeking a ground-based sensor system to help controllers detect these hazardous conditions and determine optimum aircraft spacing.[73]

Increasing airport capacity by increasing the number of airplanes that can land in a given period has the drawbacks of increased noise, terminal burdens and reduced runway occupancy time. It is probable that airport capacity can best be raised through a combination of operational improvements and new facilities, as well as technological innovation.[74]

MARINE TRANSPORTATION

During the past two decades, technological changes in the marine sector have increased efficiency through greater vessel specialization. Ocean ships grew tremendously in size, especially bulk carriers.[75] Larger vessels cut capital and operating expenses (principally labor and fuel costs) for each unit of cargo moved, but reduce flexibility.[76] General cargo handling was revolutionized by container and roll-on/roll-off ships, which lowered labor needs and raised productivity, but greatly increased capital requirements.[77]

In the domestic trades, barge tows on the inland waterways grew to the maximum practical sizes for different reaches of the system.[78] Specially designed coastal barges are now in service.[79] On the Great Lakes, new bulk carriers have expensive automatic-cargo-handlers,[80] and mammoth vessels confined to the upper four lakes are being constructed.[81] Experimental efforts have been underway to extend the Great Lakes shipping season through technological means.[82] Lakers normally are idle three to four months each winter, entailing costs to the shipping industry and forcing shippers to employ alternate means of transport or stockpile goods.

Efforts to cut costs and improve service should continue to play a key role in creating new marine technology. The development of equipment tailored to specialized tasks should continue.[83] Ships and equipment that will allow entry into new markets are expected to be developed.[84]

The technological innovations examined within the marine sector involve cost reduction, performance improvement, or the development of new types of service. The two most significant, near-term innovations appear to be liquefied-natural-gas (LNG) carriers and deepwater ports. Three engine technologies examined would reduce cost through fuel savings: diesel engines, nuclear ships, and gas turbine engines.

Liquefied-Natural-Gas Carriers

To augment the energy available to the U.S., projects to import natural gas are in operation and numerous others are proposed. Many sources of supply are on other continents and because this natural gas must be shipped as a liquid (called LNG) at temperatures below −259°F, extremely expensive, specialized ships and terminals are required.

The safety of LNG ships is in dispute. The concern is that a collision could cause a ship's tanks to rupture, allowing spilled LNG to revaporize and form a cloud which could ignite. Advocates and opponents of LNG operations hold widely divergent views on the physics of cloud formation, movement, and hazard.[85] The establishment of ports in less populous areas or offshore sites is a possible solution.

The number of LNG ships needed for the U.S. trade will be determined by import demand, which is largely dependent on factors external to the marine sector. Based on a volume of imports similar to that forecast by the NTPSC modelling efforts, one estimate places the number of LNG ships (of 125,000 cubic meters capacity) serving the U.S. at 15 in 1980, and 50 in 1990.[86] In June 1978, four LNG vessels were in the U.S. fleet, and as of September 1978, fourteen LNG vessels were under contract to U.S. shipyards.[87]

Deepwater Oil Ports

The past two decades have witnessed phenomenal growth in the size of oil tankers, because larger tankers can operate at substantially lower costs.[88] However, the East and Gulf coasts of the U.S. contain no port deep enough to accommodate supertankers, so the maximum possible savings have not been achieved. Man-made deepwater oil ports could cut the cost of shipping crude oil to the U.S. Deepwater ports involve sizeable capital outlays, but lower total operating expense compared with current oil importation methods. A study conducted for DOT indicated that the transportation costs of oil from the Persian Gulf could be reduced up to 30 percent by the utilization of LOOP (the Louisiana Offshore Oil Port), the only U.S. facility that has received a license and begun construction.[89] A deepwater facility consists of an off-shore terminal for unloading supertankers, pipelines for getting the oil to shore, and on-shore facilities that merge the oil into the distribution system.

The net consequences of deepwater ports are uncertain, and there is vigorous debate whether regular methods of delivery or deepwater ports pose more threat of oil spillage and damage from associated on-shore development.[90]

One or possibly two deepwater terminals may be built on the Gulf Coast.[91] It is unlikely in the near term that deepwater oil ports will be built on the Atlantic or Pacific coasts. No single location on the Atlantic coast has adequate refinery capacity to process a high volume of imports, and environmental sentiment exists against them.[92] The West coast is expected to rely less on imports than on oil from Alaska, moved in smaller tankers.[93] But even if only one port were constructed on the Gulf, it would have significant impact because of its size.

Fuel-Saving Engines: Diesel, Nuclear and Gas Turbine

Worldwide, diesel engines are the most common marine power plant, but they are rare in the U.S. international fleet. Most U.S. ships are powered by steam engines which burn residual fuel, and no U.S. manufacturer currently fabricates large marine diesels.[94] Slow-speed diesel engines consume 20 percent less fuel than comparable steam plants.[95] If the U.S. fleet switched to diesel, a considerable fuel savings would take place, but other matters than fuel economy need to be compared. Diesels are not suitable for every vessel type and certain undesirable operating characteristics may outweigh potential fuel consumption advantages.[96]

It is unlikely that other engine types will play a major role during this century. Nuclear-powered ships would substitute uranium for petroleum, giving diversification of energy sources. However, construction costs are enormous while economic potential has not been demonstrated, and environmental, regulatory and liability problems may arise.[97]

Marine gas-turbine engines will offer fuel savings if technological improvements occur at the fast pace foreseen by the engine's proponents. They expect that fuel consumption by 2000 will be less than one-half that of present steam turbines. However, achieving that level would require major advances in the use of composite materials, the development of a combined cycle, and improved fuel additives.[98]

PIPELINE TRANSPORTATION: SLURRY PIPELINES

Technological changes in pipeline transport to the year 2000 are expected to be evolutionary in nature, motivated either by the prospect of operating efficiencies with conventional systems or by the need to meet engineering challenges posed by harsh environments. Examples of future innovations motivated by the former include:

1. Greater use of computers to control pressure variations, optimize duty cycles and monitor leak-detection systems;
2. Metallurgical improvements to permit higher operating pressures;
3. Friction-reducing coatings or additives to reduce friction losses, improve energy utilization and extend capacities of existing systems;
4. Heat-engine improvements such as bottoming cycles and gas turbine regenerators to improve energy efficiency through waste heat utilization; and
5. Corrosion control improvements to increase safety and reduce maintenance.[99]

Examples of innovations which will facilitate pipeline operations in harsh environments include:

1. Metallurgical improvements allowing very low temperature operation; and
2. Engineering solutions to frost-heave and ground-subsidence problems.[100]

Market expansion is a strong motivation for innovative change in the pipeline industry. Traditionally, pipelines have transported liquid and gaseous products almost exclusively. Before the end of the century, however, it is conceivable that solids and slurry pipelines could become important elements of the transportation system, either in competition to or in conjunction with conventional freight transporters. Because of the impact this market expansion could have, slurry pipelines were selected for further review.

In order for solids to be transported in slurry form, the material must be finely ground and suspended in a liquid[101] before being pumped through a line. These requirements limit the materials which can be transported to such commodities as coal, ores, minerals, and gravel.[102]

Technological feasibility is not in question; slurry pipelines are operating in many countries on a limited scale. Total U.S. slurry pipeline length is less than 400 miles.[103] This total could increase significantly in the 1980s through increased western coal production and the subsequent need to move the coal by rail, barge, and perhaps slurry pipeline.[104]

In general, transport conditions which favor slurry pipelines over competing modes are long distances, high volumes, no existing rail lines or inadequate capital to improve poor rail conditions, and high rates of inflation.[105] Aside from feasibility, which can be determined on an origin-destination basis, the future of the coal slurry pipeline is likely to hinge on the ability of organizers to obtain both rights of eminent domain and adequate water supplies.[106]

One intriguing scheme for coal-slurry pipeline development is the conversion of under-utilized oil and natural gas pipelines to carry slurry. If this change can be made, the flexibility of the entire pipeline system would be enhanced and slurry pipelines would be in operation with far less capital cost. The technical feasibility of conversion hinges on the question of whether the greater abrasiveness of coal will cause excessive wear on the steel used in existing pipelines.[107]

POTENTIAL BENEFITS FROM TRANSPORT TECHNOLOGY INNOVATION

Table 12 summarizes potential effects from implementation of the key transport innovations investigated by the NTPSC. Major effects are divided into eight categories, including traditional concerns such as costs, level of service, safety and accessibility, plus areas of more recent concern, namely energy and environmental effects. Within each category in the table, a plus indicates a beneficial effect, a minus indicates a potential detrimental effect and "U" indicates that the potential effect is uncertain. Blanks indicate that no major change is expected. The overall impact on transportation was derived through subjective evaluation by the NTPSC staff of the eight individual categories. The right half of Table 12 presents information on six potential barriers to technology and three current government roles, indicating how each potential technology is likely to be affected by barriers and how government is presently concerned with the technology. Each instance of a barrier or a government relationship

TABLE 12. Potential benefits to be gained from technological innovation

	Major Effects on Transportation									Potential Major Barriers						Current Government Role		
Technology	Operating Cost	Capital Cost	Level of Service	Market Expansion	Safety	Mobility/Accessibility	Energy Consumption of Substitution	Environmental	Overall Effect	Technology Feasibility	Capital Formation	Market Acceptance	Industry Characteristics	Government Regulation	Compatibility with Support System	Research, Development Demonstration	Finance	Regulation/Mandate
Highway																		
Alternative Auto Engines:																		
Diesel	+						+	–	u									x
Stratified-Charge SI	+						+	+	+									x
Gas Turbine and Stirling	+	–					+	+	u	x					x	x		x
Electric and Hybrid Vehicles		u	–	+	u		+	+	+	x		x			x	x	x	x
TRANSBUS		–	u			+			u								x	x
Urban Traffic Control Systems			+	+			+	+	+							x	x	x
Truck Size/Weight Variation	+	–	u	+	u		u		u		x			x	x			x
Guideway																		
Increased Automation of Monitoring & Control	+		+	+		+			+	x			x			x		
Advanced Intermodal Rolling Stock & Terminals	+	–	+	+	+		+		+		x	x	x	x	x	x		x
Railroad Electrification	+	–	+	u			+		u		x				x		x	
Automated Guideway Transit	+	–	+	+	u	+		+	u						x	x	x	
Energy Recovery Systems	+						+		+							x	x	
Air																		
Engine-Component Improvement	+						+	+	+							x		
Supercritical Wing Design	+						+		+							x		
Active Controls Technology	+						+		+							x		
Energy-Efficient Engines	+	–					+		u	x	x					x		
Composite Materials	+						+		+	x	x					x		
Air Traffic Control Improvements	u	–	+		+		+	+	u	x	x					x	x	x
Marine																		
LNG Carriers				+	u				u			x		x			x	
Deepwater Oil Ports	+	+	+					u	+						x			x
Fuel Saving-Engines		u	u		u		+	u	u	x						x	x	x
Pipeline																		
Slurry Pipelines	+	u	+	+			u	u	u					x				x

SOURCE: Compiled in the course of NTPSC research.

KEY:
+ Technology may have beneficial effect
– Technology may have detrimental effect
u Effect of technology is uncertain
(Blank indicates no major change expected)
x Factor applicable to implementation of a technology

applicable to a key technology is marked by an "x." The table therefore indicates some of the forces that may affect the development of new technologies.

Twelve of the technologies were judged to offer overall benefits. Improved spark-ignited engines (uniform and stratified charge) are being designed to help meet energy and emissions mandates for automobiles and they do not have significantly higher capital costs. Urban transportation control systems improve traffic flow, especially for buses. The main result is improved service levels with secondary positive impacts on energy and the environment. Electric/hybrid vehicles cannot promise similar performance characteristics to automobiles powered by heat engines, but may shift a portion of auto fuel consumption away from petroleum-based fuels and may simplify emission control problems. Further, the purpose of electric/hybrid vehicles is not to replace conventional automobiles in full, but to serve urban and short-range markets. Energy-recovery systems for heavy-rail transit conserve energy dissipated in car braking. In addition, the on-board flywheel does not increase capital cost significantly when installed on new cars. Increased automation of monitoring and control processes, advanced intermodal rolling-stock design, and intermodal terminals for rail freight transport reduce operating costs and improve service levels. However, such intermodal terminals have high capital costs. Except for energy-efficient engines and air traffic control improvements, all the aircraft innovations have unqualified positive benefits. Finally, in the marine sector, the use of supertankers at deepwater ports offers reduced operating costs, but has uncertain environmental effects. The use of diesel engines for ocean-going ships reduces fuel costs. Nuclear ships, although high-speed, are capital-intensive and may entail safety risks.

Other technologies have an uncertain net effect at this time. The automotive diesel engine has unattractive environmental characteristics, but offers fuel economy advantages over spark-ignited engines. The automotive and marine gas-turbine engines and the automotive Stirling engine offer potential fuel economy improvements and emissions reduction but require large development and capital costs. While Transbus enhances the mobility of the handicapped and elderly, it entails higher capital costs than standard buses and an uncertain effect on travel times. Increased truck size or weight limits reduce motor carrier operating costs but result in increased highway costs, and safety aspects have been questioned. Rail electrification likewise requires a great deal of capital for reducing dependence on petroleum. Automated Guideway Transit potentially offers a high level of service and greater mobility, but it is expensive and poses safety questions. The net effect of LNG carriers depends both on the desirability of importing natural gas and on safety aspects. Finally, the overall impact of coal slurry pipelines must be determined on a point-to-point basis. Capital costs and water availability are two important considerations.

COMMUNICATIONS

Today, an electric circuit on a chip perhaps a quarter-inch square can embrace more electronic components than the most complex piece of electronic equipment that could be built in 1950. At the same time, circuit reliability has improved sharply while power consumption and price have dropped dramatically. A microcomputer "at a cost of perhaps $300, has more computing capacity than the first large electronic computer, ENIAC,"[108] built in 1946. More importantly:

> . . . it is 20 times faster, has a larger memory, is thousands of times more reliable, consumes the power of a light bulb rather than a locomotive, occupies 1/30,000 the volume and costs 1/10,000 as much.[109]

Advances in electronics are taking hold in telecommunications. Transmission capacity is greater and the variety and capability of terminals, such as telephone handsets and computer input and output devices, are increasing dramatically. In the early 1960s, communications satellites were in the experimental stage. In 1965, the International Telecommunications Satellite Organization launched INTELSAT I with a design lifetime of 1.5 years, a capacity of 40 telephone circuits, and cost per circuit per year of $32,500. In 1979, INTELSAT V is scheduled for launch with a design lifetime of 7 years, a capacity of 12,000 circuits, and a cost of $800 per circuit per year.[110]

While satellites are revolutionizing long-distance communication, developments in coaxial cable and optical-fiber transmission systems are likely to alter local or urban communication. Optical fibers in particular can carry 100 or perhaps even 1,000 times as many conversations as today's coaxial cable systems.[111]

In the future of telecommunications technology, several trends are discernible. The first is that the telephone will become a more powerful tool, for both data communications and voice interaction. Second, new and different telecommunications alternatives will become available as hybrids, made up of a telephone connection in conjunction with another instrument—such as a facsimile machine or a television set. Methods other than today's analog lines will be used to distribute telephone signals locally. Finally, expanded use of non-telephone communications paths will soon become possible.[112]

The potential impacts of the above on transportation are far-reaching. Telecommunications applications can enhance the efficiency and reduce the costs of operations of all modes of transportation, through improved rail-car scheduling, advanced air traffic control, urban vehicle-monitoring systems, and urban traffic-control systems, among others. As these improvements were already considered in transport technology discussions earlier in this chapter, they will not be reviewed further. The remainder of this section considers the impact of telecommunications technology on future transportation demand.

IMPACT OF COMMUNICATIONS TECHNOLOGY ON TRANSPORT DEMAND

Innovations in communications affect transportation demand in three principal ways:

1. Eliminating the need for some trips or shipments;
2. Stimulating economic activity, generating new demand; and
3. Altering urban and regional development patterns.

Two primary areas of communications technology that will potentially affect transportation demand are: (1) voice/video, and (2) data communications. The transmission of data is the most promising area of development in its potential to influence transport. Some of the major innovations are focused on the electronic transfer of funds, electronic mail, and two-way, point-to-point communications via cable television. The principal development in the voice/video field is the teleconference.[113]

In both areas it is believed that telecommunication offers potential to reduce the need for transportation, although how much reduction is uncertain. It has been pointed out that, like the early telegraph, there is some chance that advances in telecommunications may actually stimulate the demand for travel.[114] Historically, the improvement of communications and the expansion of transportation have gone hand-in-hand, so that the assumption of telecommunications substituting for travel may be unwarranted. It is therefore necessary to be cautious in assuming that rapid expansion of the market for telecommunications in the U.S. implies significant displacement of demand for transportation. In many respects, the fields of transportation and telecommunication may ultimately be related to one another through substitution, or mutual reinforcement of demand.

DATA TRANSACTIONS

The vast majority of today's data and image transmission occurs over telephone lines; a small percentage takes place via microwave and satellite. Because most of the information travels over standard telephone lines, which were originally designed to carry voice signals, it must travel as an analog, or continuous but varying, electrical signal. But data transaction terminals typically generate and process digital, or discrete, electrical signals. The conversion from analog to digital not only increases cost, but limits efficiency. Present-day voice circuits can handle a maximum 9,600 bits per second (bps).[115] On the other hand, the data transaction devices using these telephone lines are capable of handling information at speeds which are orders of magnitude higher—in the megabits per second range.

There are two kinds of data transactions: (1) computer or data processing equipment input and output transactions, and (2) "correspondence" type transactions, such as memos, contracts, short reports, or what might be called electronic mail.

Data Communications

In computer input and output exchange, large computers process information received from remote terminals and send back reports. In returning processed information, the lack of a reasonably-priced, high-capacity circuit precludes some uses of data communications to return reports. Instead, reports are loaded into a truck, either in paper form or computer tape, and shipped back to remote sites, in some cases as often as every night. A firm which distributes data in this fashion could realize significant savings if high-capacity communications were readily available at reasonable cost. The major reason the data cannot be transmitted is that transmitting volumes of data at 9,600 bps, the highest speed possible over present phone lines, would take days. Although leasing higher-capacity lines or other high-capacity transmission systems is possible, they are extremely expensive relative to low-capacity lines.

Electronic Correspondence

Electronic mail is expected to emerge rapidly, through use of facsimile, communicating word processors, terminal and computer-based message systems and optical character recognition. Electronic developments have already reduced the need for mail delivery to businesses and for messenger services to carry memos, proofs and other documents. Some U.S. cities have facsimile centers, where one can pay to use a privately-owned facsimile terminal just as one can use a duplicating machine in a copying center.[116] Several large firms which use computers extensively have replaced almost all terminal correspondence with computer-based message systems.[117] Also, Electronic Funds Transfer Systems (EFTS) promise to alleviate not only paper transactions, but the travel necessary to make transactions. Bank-to-bank funds transfer is already almost totally electronic.[118]

Facsimile, which can transmit information in graphic or written form over telephone lines, is the most prevalent form of electronic mail. There are now 170,000 terminals installed in the U.S.,[119] serving a wide range of purposes. Facsimile equipment is available from a number of manufacturers, with current transmission speeds ranging from 20 seconds to 6 minutes per page.[120]

Future Handling of Data Communications and Electronic Correspondence

The field of data communications appears at the threshold of creating cost-effective, energy-efficient products that will preclude the necessity for shipping most information-bearing parcels and letters. The capability to send and receive documents electronically is already feasible from a technological standpoint. In the next decade, prices are expected to fall, making such products commercially attractive.[121]

VOICE AND VIDEO COMMUNICATIONS

The information that travels over various transmission media, such as telephone lines, microwave, satellite, or fiber optics, can itself take on various forms. In business, different modes of telecommunications satisfy different requirements for information exchange, from a simple phone call to a teleconference with several people.

Non-complex exchanges of information are handled by telephone, or (as with facsimile) over telephone lines. The telephone is the foundation for most teleconferences which do not require video interaction. An audio teleconference may be enhanced by the use of facsimile machines, to transmit and receive copies of documents for conference participants. These machines can be linked by regular phone lines, as are the participants, so that when illustrating a particular point, a copy of the relevant graph or chart may be sent to all concerned.

A step towards face-to-face effectiveness in teleconferencing is the implementation of interactive, audiovisual communications. The American Telephone and Telegraph Company's (AT&T) entry into this mode of telecommunication is called Picturephone Meeting Service, or PMS. There are PMS Centers in New York City, Los Angeles, Chicago, San Francisco and Washington, D.C., and PMS Conferees must use one of these centers.[122] While a few private systems are in operation, aside from PMS there are no commercial offerings of video conferencing at present.

FUTURE OF COMMUNICATIONS TECHNOLOGY

A major change likely over the next decade is the convergence of data with voice and video communications. This trend, which can be seen today, may be accelerated by an increase in the amount of information sent in digital form.[123]

Digital facsimile exists, and its use should become more widespread as the cost of channel capacity decreases. Color facsimile terminals for perhaps $3,500 to $4,000 could be available by the middle and late 1980s. The price should drop to $1,500 or $1,000 within 5 to 10 years after that.[124]

With microprocessors becoming significantly more powerful, and with inexpensive, accessible memory approaching the terabit (one trillion bit) level, the early 1980s should herald the coming of multifunctional terminals, with color video displays, large memories, high-speed, non-impact color printers, optical image readers for input without retyping, and the ability to communicate with other terminals or terminal-based message systems.[125]

As the cost of channel capacity decreases, and video technology improves while prices fall, the market for teleconferencing products and services should expand. The extent of market growth is unclear, but indications are that there will be no mass movement to teleconferencing by business and certainly none by home users. It seems likely that the primary market developing in the 1980s will be limited to large corporations and to government organizations—perhaps 300 to 500 user groups. These groups will use a variety of teleconferencing equipment, from slow-scan video to full motion color. Some hospitals and medical centers may use teleconferencing for discussing emergency medical procedures both among themselves, and with remote stations. Some colleges may use teleconferencing on a limited basis, probably through two-way cable television. In addition, AT&T's Picturephone Service should continue to attract a segment of intermittent teleconferencing users.[126]

CONCLUSIONS

Transportation requirements could be directly affected by the increased use of telecommunications. While analyses to date have been largely conjectural, the broad outline of impacts on transportation can be discerned.

With regard to the use of telecommunications as a substitute, two areas which appear to be likely candidates are the electronic transfer of funds and electronic mail. It is estimated that from 13 percent to 31 percent of all U.S. mail could be delivered electronically, were the necessary systems in place. Another 23 percent could be electronically transmitted between central distribution centers, to be physically disseminated locally.[127] Eventually the role of the postal service could be reduced to that of delivering parcels and objects. Besides electronic mail, the electronic transfer of funds is achieving more widespread use. It is expected that this will become ubiquitous by the 1990s. As early as 1980, the Federal Government will have converted nearly half of its 62 million monthly payroll checks to EFTS.[128]

Introduction of teleconferencing technology is underway, although it may as often stimulate as replace or supplement the need for travel. Teleconferencing's total effect on the demand for transportation is uncertain. There could be some impact on air transport, replacing business trips with audio/visual transmission.[129] A second area of potential impact is commuting. Telecommunications has already permitted some decentralization of business sites and it may encourage work at home. Estimates indicate that over 30 percent of commuter travel[130] and 20 to 60 percent of local business travel[131] could be eliminated. Other areas that may be influenced include entertainment and shopping.

In many respects, the question of human acceptance represents a more substantial problem than the development of the technology. Acceptance of telecommunications by individuals is likely when it provides access to new sources of information or entertainment. Cable television gained its initial popularity by providing good reception in isolated areas, and by diversifying its programs it acquired an urban audience as well. As the range of accessible information increases, the use of telephone, cable TV, and other avenues of access should increase. Another spur to telecommunications is its ability to increase available leisure time. Electronic funds transfer, payment of bills by telephone, and shopping from the home can reduce the time consumed by transportation.

Institutions, though, are almost the exclusive users of teleconferencing, facsimile, and electronic message systems. In general, teleconferencing can be used most effectively for relatively routine exchanges of information between people who have already met frequently. Decreased travel costs due to telecommunications are a significant factor in some cases. However, in most organizations where teleconferencing is in use, the overall travel budget has not been reduced; rather, money has been redirected for travel other than to and from meetings.[132] One possibility that could make teleconferencing more significant in terms of substituting for transportation would be a drastic increase in the cost of energy.

There are limitations on both institutional and individual use of telecommunications. At the institutional level, depersonalization and lack of familiarity with telecommunications, problems associated with security, and overall corporate inertia may impede innovation. For the individual, many of these same problems appear, combined with other barriers such as cost and a threat to privacy. A further barrier in both sectors could be government regulation. Attempts by regulation to prevent competition in communications in order to promote economies of scale and utilization might inhibit the development of communications technology.[133] A series of court rulings and FCC decisions has served to reduce the extent of Federal, state and local regulation of telecommunications.[134]

It is too early to say with certainty what the effect of telecommunications will be upon transportation. Numerous factors combine to create this uncertainty. In some cases, a technology may reduce demand; in others, it may have the opposite effect. The cumulative results of these separate effects, when combined with the uncertain state of the market for telecommunications, the role of government and the possibility of unforseen inventions, make it impossible to predict what may develop in terms of the impact of telecommunications upon transportation by the year 2000.

SUMMARY

Technological innovations in both transportation and communications will continue to be spurred by economic incentives. Additionally, the last decade has witnessed significant government-directed or mandated requirements that reflect objectives external to the transport or communications markets.

Safety, environmental, energy conservation, and anti-inflationary requirements can constrain or redirect the supply and performance of transport services away from a path dictated solely by internal efficiency criteria. A challenge for transportation is balancing these different goals with existing and proposed transport services. Technology can play a role in meeting the numerous goals established for transportation.

In the passenger market, external objectives imposed by government strongly influence technology, particularly for auto and air transport. There are significant targets of opportunity for these modes such as energy-efficient, clean-burning, quiet propulsion systems, that could be supported or accelerated by stronger government promotion designed to reduce private risks on advanced, unproven, yet potentially beneficial designs.

In the freight market, traditional economic forces continue to be the impetus behind technological innovation. In this sector many of the physical changes that occur are likely to be "soft" technological changes, involving more efficient use of existing technology. These targets of opportunity could be aided by effort on the part of government to reduce unnecessary regulatory barriers.

External forces will play a greater role as a constraining factor in the development of innovations. Eminent domain and water availability constraints surrounding coal slurry pipeline development give an example.

During the remainder of this century a variety of technological changes is expected to alter transportation. Although the introduction of new technologies has long been the norm, technological development in transport and communications is now being stimulated and limited in novel ways. Innovative developments are evaluated not only by their impact on traditional transportation goals, but also by the way change supports national goals previously external to the transport sector; the result is profound but complicated influence on the nature and rate of technological development.

NOTES AND REFERENCES

1. The results summarized in this chapter are discussed in detail in U.S. National Transportation Policy Study Commission, *Telecommunications and Transportation,* Report No. NTPSC/SR–78/03, Washington, D.C.: 1979; and U. S. National Transportation Policy Study Commission, *Transportation Technology,* Report No. NTPSC/SR–79/09, Washington, D.C.: 1979. It should be noted that some NTPSC Commissioners are convinced that telecommunications will become a transportation mode.
2. Oak Ridge National Laboratory, *Transportation Energy Conservation Data Book: Edition 2,* prepared for U.S. Energy Research and Development Administration, Oak Ridge, Tennessee: 1977, p. 27.
3. Energy Policy and Conservation Act, 42 U.S.C. Section 6201 *et seq.* (1975), Pub. L. 94–163, 89 Stat. 871.
4. Clean Air Act Amendments of 1977, 42 U.S.C. Section 7401 *et seq.* (1977), Pub. L. 95–95, 91 Stat. 685. The effects of this Act are described more fully in the next chapter.
5. The Federal Task Force on Motor Vehicle Goals Beyond 1980, *The Report by the Federal Task Force on Motor Vehicle Goals Beyond 1980,* 2 volumes, prepared for the Energy Resources Council, Washington, D.C.: Government Printing Office, 1976. (Hereafter cited as the *Task Force Report.*)
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7. Brian Ketcham and Stan Pinkwas, "Diesels and Man," *New Engineer,* April 1978, p. 24.
8. *Ibid.*, p. 26.
9. E. G. Barry, F. J. Hills, A. Ramella and R. B. Smith, "If Autos Go to Diesel Fuel," *Hydrocarbon Processing* 56 (May 1977), p. 115. (Hereafter cited as "If Autos Go to Diesel.")
10. The Clean Air Act Amendments of 1977, (Pub. L. 95–95, 91 Stat. 685, amending 42 U.S.C. Section 7401 *et seq.* (1977)) postponed imposition of the 0.4 gm/mi NO_x standard set by the Clean Air Act of 1970 (Pub. L. 91–614, 84 Stat. 1676 amending 42 U.S.C. Section 1857 *et seq.* (1978) recodified Section 7401 *et seq.*) until further research is conducted.
11. "If Autos Go to Diesel," p. 115.
12. Lawrence H. Linden, "Alternative Automotive Engines and Energy Conservation," presented at the Fourth National Conference on Effects of Energy Constraints on Transportation Systems, August 1977, Union College, Schenectady, N.Y., Washington, D.C.: U.S. Department of Energy, 1977, p. 88.
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14. California Institute of Technology, Jet Propulsion Laboratory, *Should We Have a New Engine? An Automobile Power System Evaluation,* Vol. I, Pasadena, Calif.: 1975, pp. 59–60.
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16. *Ibid.*, p. 338.
17. Federal Task Force on Motor Vehicle Goals Beyond 1980, *Task Force Report,* Vol. 1, p. 17.
18. Electric and Hybrid Vehicle Research, Development and Demonstration Act of 1976, 15 U.S.C. Section 2501 *et seq.* (1978), Pub. L. 94–413; as amended by the Department of Energy Act of 1978, Civil Application, Pub. L. 95–238, Sections 601–603, 92 Stat. 47.
19. U.S. Department of Energy, *Electric and Hybrid Vehicle Demonstration 1978,* Report No. DOE/CS–0046, Washington, D.C.: 1978, p. 3.
20. *Ibid.*, p. 5.
21. University of California/Livermore, Lawrence Livermore Laboratory, *Energy Storage Systems for Automobile Propulsion, Vol. 1—Overview and Findings,* draft report, prepared for U.S. Energy Research and Development Administration, Livermore, California: 1977, p. 5.
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23. Since passage of the Rehabilitation Act, an intense debate has occurred between those who believe the handicapped have the right to use public transportation with the same ease as able-bodied individuals, regardless of cost, and those who believe the handicapped can be served more efficiently by other forms or mixes of transportation services.
24. David Young, "The Transbus Compromise," *Mass Transit,* January/February 1979, p. 12.
25. U.S. Office of Technology Assessment (OTA), *Urban Transit Vehicle Development: A Preliminary Analysis,* Washington, D.C.: Government Printing Office, 1977, p. 38. Purchase cost estimates are uncertain at this time, though one estimate is $250,000, more than twice what a new standard bus sells for at present. See: "Transbus for Handicapped Stalled by Lack of Bidders," *Washington Post,* 3 May 1979, p. A–3.
26. See: Harvard University, *Improving Urban Mass Transportation Productivity,* prepared for Urban Mass Transit Administration, Washington, D.C.: 1977, p. 122. A reduction in

air pollution emitted by buses also can result from more ideal driving cycles, but any extra pollution emitted by other vehicles forced to delay should be netted out to determine pollution effects from UTCS.

27. See: Federal Task Force on Commercial Motor Vehicle Goals Beyond 1980, *Interagency Study of Post-1980 Goals for Commercial Motor Vehicles,* draft report, prepared for the Energy Resources Council, Washington, D.C.: 1976, p. II–28.
28. *Ibid.*
29. It should be noted that the U.S. DOT is performing a major study of vehicle sizes and weights; the study is required by Section 123 of the Surface Transportation Act of 1978, 23 U.S.C., Section 141 (1978), Pub. L. 95–599. It will be subject to public participation and review by a technical panel established under DOT contract with the Transportation Research Board of the National Academies of Science and Engineering.
30. Federal-Aid Highway Act of 1956, 23 U.S.C. Section 127 (1956), Pub. L. 84–627.
31. 23 U.S.C., Section 127 (1975) amendments set the following limits on the Interstate Highway System unless higher state limits were allowed before July 1, 1956:

Single Axle	20,000 lb.
Tandem axle	34,000 lb.
Overall Gross Weight	80,000 lb.
Width	96 inches.

32. There is some interest in trailer width increases from 96″ to 102″ (as now allowed for intercity buses) but such a change appears constrained by lane width. Increases in combination lengths raise further questions of off-tracking with certain vehicle and road configurations. For a discussion see: Robert E. Whiteside, *et al., Changes in Legal Vehicle Weights and Dimensions, Some Economic Effects on Highways,* National Cooperative Highway Research Program Report 141, Washington, D.C.: Highway Research Board, 1973.
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34. For one estimate regarding the costs of extra weights on construction, see Fuller, *Ibid.,* Table 27, p. H7613.
35. For further discussion of issues surrounding Federal size and weight limits see: National Transportation Policy Study Commission, *Current Transportation Issues in the United States, Vol. II: Issue Papers and Source Materials,* Report No. NTPSC/SR–78/01–B, Washington, D.C.: 1978, pp. 89–97 (Available through National Technical Information Service); R. J. Hansen Associates, Inc., *State Laws and Regulations on Truck Size and Weight,* National Cooperative Highway Research Program Report 198, Transportation Research Board, Washington, D. C. : 1979; and U.S. Department of Transportation, Office of the Assistant Secretary for Policy and International Affairs, *Truck Size and Weight: An Issue Paper,* by Philip J. Barbato and Carl N. Swerdloff, Washington, D.C.: 1978, especially pp. 36–40.
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49. OTA, *Urban Transit Vehicle Development,* p. 72.
50. In 1975, the U.S. National Aeronautics and Space Administration (NASA) initiated the Aircraft Energy Efficiency (ACEE) Program, a ten-year multiphased effort for the accelerated development of technology to improve the energy efficiency of transport aircraft. The ACEE effort encompasses propulsion, aerodynamics and structures.
51. Investigations by NTPSC Commissioner William H. Tucker and staff member Samuel Colwell at the September 1978 Farnborough International Airshow suggest that foreign aircraft producers have special innovative aircraft which are likely to be placed in U.S. service in the next few years. These European, Canadian and Australian craft may be better suited to commuter carrier service to and from small communities than most current products of U.S. manufacturers.
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55. *Ibid.*
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57. At jet transport speeds, regions of supersonic and subsonic airflow develop over the wing. These are defined as transonic regions. Airfoils with transonic or "supercritical" (NASA's designation) shape are designed to minimize the shock in the airflow that develops between these two regions.
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68. *Ibid.*
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100. Cesar DeLeon, Acting Director, Office of Pipeline Safety, Materials Transportation Bureau, U.S. Department of Transportation, telephone interview, 23 November 1977.
101. Methanol, crude oil and sewage treatment effluent have also been proposed in addition to water as coal slurry media.
102. Pipelines transporting encapsulated solids in liquids or gases are being investigated, but this technology is at an early stage of development for long-distance bulk movements. See, for example, University of Pennsylvania, Department of Civil and Urban Engineering, *Transport of Solid Commodities Via Freight Pipeline, Vol. I,* by I. Zandi, prepared for the U.S. Department of Transportation, Report No. DOT–TST–76T–36, Washington, D.C.: 1976, p. E–6.

103. This includes two coal slurry pipelines: the 273 mile Black Mesa Pipeline and the 108 mile Consolidated Coal Co. pipeline (which is no longer in operation).
104. President Carter, in his energy program presented on 5 April 1979, endorsed coal slurry pipelines as an economic and competitive method for coal movement, and he supported legislation to provide rights-of-way. See U.S. President, Office of White House Press Secretary, "Fact Sheet on the President's Program," Press Release, Washington, D.C.: 5 April 1979, p. 18.
105. Paul Souder of General Research Corporation, briefing to NTPSC staff, April 1978. Mr. Souder is author of *A Study of the Economic and Competitive Impact Associated with Coal Slurry Pipeline Implementation,* prepared for the U.S. Office of Technology Assessment by General Research Corporation, McLean, Virginia: 1977.
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107. Congressional Research Service, *National Energy Transportation, Volume III, Issues and Problems,* prepared for U.S. Senate, Committee on Energy and Natural Resources, and Committee on Commerce, Science and Transportation, Washington, D.C.: Government Printing Office, 1978, p. 198.
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114. U.S. Department of Commerce, Office of Telecommunications, *The Contribution of Telecommunications to the Conservation of Energy Resources,* M. Tyler, *et al.*, Washington, D.C.: July 1977, p. 35. (Hereafter cited as *Contribution of Telecommunications.*)
115. Dr. Norman Vogel, Director of System Communications Technology, interview held during meeting with the System Communications Division, International Business Machines Corporation (IBM), Raleigh, N.C., 24 May 1978.
116. Robert W. Ross, Counsel for Southern Pacific Communications Company, interview held during meeting with the Southern Pacific Communications Company, Washington, D.C., March 1978.
117. Howard Anderson, President, Yankee Group, interview held during meeting in Washington, D.C. with The Yankee Group of Cambridge, Massachusetts, 21 February 1978.
118. *Ibid.*
119. The Yankee Group, *Report on Electronic Mail,* Boston, Masssachusetts: July 1978.
120. *Ibid.*
121. Tyler, *Contribution of Telecommunications,* p. 42.
122. Curran Tiffany, Executive Assistant Attorney, American Telephone and Telegraph Company, telephone interview, Washington, D.C., June 1978.
123. See NTPSC, *Impact of Telecommunications,* p. 88.
124. Telephone Market Research Co., *Distribution of Bell System Operating Company Telephones,* and *Distribution of Selected Independent Operating Company Telephones,* Chicago, Illinois: January 1977.
125. The Yankee Group, *The Technical Office,* Boston, Massachusetts: August 1978.
126. Conclusions drawn from trends presented in NTPSC, *Impact of Telecommunications,* pp. 91–92.
127. Tyler, *Contribution of Telecommuncations,* p. 38.
128. H. Geller, Testimony before the Committee on Governmental Affairs, U.S. Senate, in *Hearings Before the Subcommittee on Energy, Nuclear Proliferation, and Federal Services,* held May and June, 1977, 95th Cong., 1st sess., Washington, D.C.: Government Printing Office, 1977.
129. There are some estimates that as much as 36 percent of all business meetings could be handled by teleconferencing; see: Tyler, *Contribution of Telecommunications,* p. 15. Others believe it unlikely that this percentage will be reached; see: NTPSC *Impact of Telecommunications,* p. 92.
130. D. Jones, *Must We Travel: The Potential of Communications as a Substitute for Urban Travel,* Stanford, California: Institute for Communication Research, Stanford University, March 1973.
131. S. Henneman, and R. Krzyczkowski, *Reducing the Need for Travel,* Santa Barbara, California: INTERPLAN Corporation, May 1974.
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133. For a discussion of this view, see Alfred E. Kahn, *The Economics of Regulation: Principles and Institutions, Volume II: Institutional Issues,* New York: John Wiley & Sons, 1971, p. 149.
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Transportation and Externalities

7

INTRODUCTION

This chapter describes the impacts that transportation has on the physical and social environment, with special attention to safety and pollution effects. In the post-World War II period, these external effects of transportation have become more broadly comprehended and research has been applied to mitigate them. Moreover, extensive Federal, state and local laws now control the production of some externalities, and these laws, plus the administrative regulations they require, have far-reaching impact on transportation supply and demand. The NTPSC reviewed pertinent U.S. environmental and safety laws and regulation to ascertain their effects to the year 2000. No forecast would be complete without attention being paid to the ways in which the U.S. has chosen to treat externalities, and to the benefits and costs engendered in the transportation field by U.S. policies.

APPROACH

Transportation externalities are categorized in six major fields of concern and for each area present regulations and their effects are described. Appendix Table 16 displays present U.S. environmental laws by transport market and mode. Appendix Table 17 displays, likewise by market and mode, the safety regulations applicable to transportation administered by U.S. agencies. The six fields of concern investigated by the NTPSC cut across the modes and markets of transportation, affecting both passenger transport and freight movement. The six fields were selected in consultation with expert opinion and the literature in transport, safety, and environmental research, and reflect information obtained from hearings of the NTPSC. It should be noted that this chapter's coverage of externalities is not all-encompassing. The next chapter deals with externalities that result from developing, transporting and using alternative fuels. Undoubtedly other external effects besides the six explored here in detail, plus fuel-related externalities, will be of import in the years to come. However, transport policy to the year 2000 surely must take into account the safety and environmental matters discussed below.

AIR POLLUTION

Transportation is the single largest contributor to air pollution in the U.S., accounting for 49 percent of total hydrocarbon (HC) emissions, 85 percent of carbon monoxide (CO) emissions, 47 percent of nitrogen oxide (NO_x) emissions, and 9 percent of particulate emissions.[1] These figures reflect the fleet of cars, trucks, buses, motorcycles, aircraft and railroad engines in use as of 1975. As transport activity and the number of transportation emission sources increase, the decline in transport emissions is expected to cease after 1990, even with complete compliance to present statutory standards. If transportation vehicles convert to alternative fuels, the pollution situation may worsen.

Emissions do vary from area to area, particularly for mobile-source pollutants. For example, the mobile-source sector in Washington, D.C. is responsible for 74.5 percent of regional HC emissions, in contrast to the national average of 48.5 percent, while in Houston the mobile-source sector is responsible for only 39 percent.[2]

In order to meet national ambient air quality standards for photochemical oxidants,[3] controls on CO and NO_x emissions from both transportation and stationary sources have been established. Despite emission restrictions, the number of areas not attaining ambient standards grew from 31 in 1973 to more than 100 in 1978—encompassing virtually all urban areas over 200,000 population.[4] Because the harmfulness of pollutants varies, as do the costs of lessening pollution, cost-effective strategies in nonattainment areas might focus first on one pollutant (such as HC).[5]

Major Federal control of air pollutants from motor vehicles began with the Clean Air Act of 1970.[6] This act established pollutant emission standards to be met by manufacturers of automobiles and light-duty trucks. It mandated a 90 percent reduction in tailpipe emissions of HC and CO by 1975, and of NO_x by

1976. Although it contained no requirements for particular emission control technologies, the Clean Air Act forced manufacturers to research, test, develop, and market cleaner-burning engines. Due to technological shortcomings, the statutory deadlines were extended three times by administrative and congressional action, and the standards tightened, primarily reflecting advances in control technology.[7] In spite of deadline extensions, the emission control program has contributed to nationwide reductions of HC and CO emissions. Emissions of NO_x oxide by transportation have increased slightly in concert with small increases in U.S. totals for all sources. However, NO_x emissions control programs appear to have prevented a growth in emissions proportional to transport activity or economic growth. Trends in emissions of various air pollutants, from transportation plus all other sources, since 1970 are displayed in Figure 10 and Appendix Table 18.

Amendments to the Clean Air Act in 1977 tighten existing regulations on trucks and buses (over 6,000 pounds) by requiring a 90 percent reduction in HC and CO emissions in model year 1983 and a 75 percent reduction in NO_x emissions by model year 1985.[8] By 1987, it is estimated that total truck emissions will be reduced by 30 to 40 percent over 1975 levels.[9] New in the 1977 amendments is the provision that particulate emissions from trucks are to be regulated, effective with the 1981 model year. Concern has been expressed that very fine particulates in diesel exhaust could be injurious to health, and possibly carcinogenic.[10]

The EPA is also reviewing auto emission standards for NO_x to examine whether public health needs require a 0.4 grams per vehicle-mile standard and, if so, what the cost and technological requirements would be to attain such a standard. To supplement its effort, EPA required manufacturers to submit research vehicles that emit low amounts of NO_x beginning with the 1979 model year.[11] Present and foreseeable diesel autos are not capable of meeting the standards of the 1977 amendments,[12] yet automakers are planning on larger diesel fleets in order to meet Federal fuel-economy regulations. Clean-burning diesels capable of meeting NO_x standards are important for the future, especially considering the potential large increase in NO_x emissions that could come from coal-fired power plants.

Motorcycles, which were unregulated until the 1977 amendments, emit twice the CO and six times the HC permitted by 1977 auto standards.[13] EPA is now directed to establish motorcycle standards. The 1977 amendments also grant EPA and DOT authority to regulate aircraft emissions and direct EPA to study the effects of ozone in the stratosphere, particularly the effects of ozone emitted by aircraft.[14]

Emissions control programs established under the 1970 Act were designed to ensure that vehicles comply with EPA standards. Parts of the programs affect virtually every supplier and user of motor vehicles. The following section describes the major program components. The series of programs is separated between those that are administered directly by the Federal government and those that are administered by state or local agencies.

PROGRAMS ADMINISTERED BY FEDERAL AGENCIES

Title II of the Clean Air Act, as amended in 1977, authorizes the EPA Administrator to carry out several programs designed to ensure that motor vehicles meet legislated emission standards. The programs involve: certification, selective enforcement audits (SEA), recall, warranties, anti-tampering incentives, and unleaded fuels.

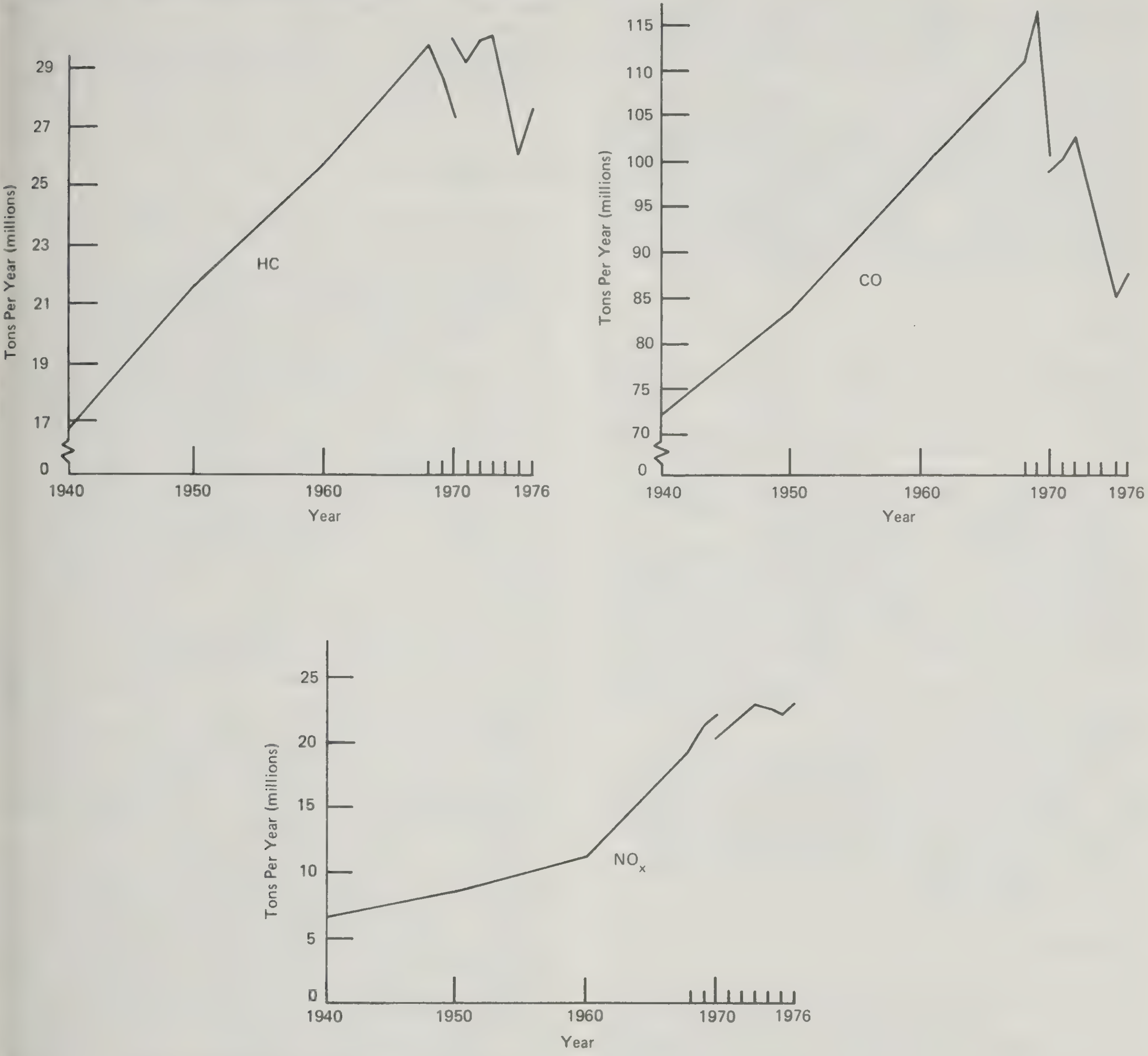
Certification

This program commands the lion's share of EPA resources devoted to mobile-source pollution control.[15] Authorized by Section 206 of the Clean Air Act, certification involves testing prototype vehicles for emission performance. If a vehicle passes the tests, the engine type is certified for mass production. Certification is to ensure that vehicles, given proper maintenance and use, are designed to meet emission standards throughout their useful lives. The strength of the program has been its success in preventing production and sale of vehicles which are not appropriately designed.

Certification requires manufacturers to prepare prototype vehicles, maintain vehicles during testing, and file reports. The administrative requirements of the certification process alone are estimated to cost domestic manufacturers roughly $32 to 40 million annually, or $4 per car produced. This estimate is above and beyond the costs of the pollution-control equipment itself. Pollution-control equipment on automobiles is estimated to cost the consumer an additional 4 percent above the base sticker price of a vehicle.[16]

Certification has been instrumental in modifying motor vehicles so they pollute less. Catalytic converter technology is one example of such a change. Field testing has shown, however, that many vehicles do not meet emission standards throughout their useful lives. Violations result from several factors, predominantly the failure of parts, poorly adjusted engines, tampering with pollution control devices and improper or inadequate maintenance. Violations can also be

FIGURE 10. Nationwide pollutant emissions, by sector, 1940 to 1976.



SOURCE: See Appendix Table 18.

attributed to inadequate basic design (i.e., the design "slips through" the certification process), but one EPA report estimates this factor to account for only 3 percent of all excess automobile emissions.[17]

Certification is an important "first hurdle" for new vehicles. Adequate design alone, however, does not guarantee satisfactory performance of vehicles on the road. The programs to be discussed next have been authorized precisely because design certification alone would not solve emissions problems.

Selective Enforcement Audits (SEA)

To ensure that an approved vehicle design is translated accurately into production, EPA tests autos coming off the assembly line. Under Section 206 of the Clean Air Act, EPA has the authority to test (or have the manufacturer test) new vehicles for emission standard compliance. EPA has chosen to administer the assembly line test through selective enforcement audits, meaning that it randomly selects vehicles from a product line for testing. EPA is empowered to revoke the certificate authorizing production of a vehicle model, and to stop production unless 60 percent of a sample passes the emissions test.[18]

SEA is used primarily as a "spot check" of the certification process and cannot claim substantial pollution reductions in and of itself. Instead, it supplements and bolsters the effectiveness of certification. Conducted in tandem, certification and SEA programs minimize emission violations due to poor design or poor translation of design into production.

Recall

If a particular line of vehicles has significant emissions violations, EPA may request or order the manufacturer to recall those vehicles for repair. Recalls, authorized under Section 207 of the Clean Air Act, take place at the manufacturer's expense. Through recall, the manufacturer is held responsible for the performance of vehicles in use.

In the mid-1970s, approximately 7 percent of the automobiles of a given model year were recalled.[19] When a recall was ordered, roughly 50 percent of the vehicles were returned for repairs by the owner. Costs to the manufacturer for repairs generally range from $10 to $30 per vehicle.[20] Because some recall actions resulted in the repair of as many as 500,000 vehicles, recall can be costly.

The premise of recall is that a manufacturer will find initial conformity with standards more prudent than repairing the vehicles at a later time. Recall imposes a responsibility on the manufacturer to consider the emissions performance of vehicles throughout their useful lives.

Warranties

In another attempt to increase the manufacturer's liability for vehicle performance, the Clean Air Act requires that a manufacturer warrant its product against emission control defects and emission standard violations. For this warranty to become effective, EPA has had to develop a short test procedure for vehicles in use which correlates to the full-scale test undertaken during certification. Further, EPA must specify criteria for determining whether a vehicle has been properly maintained, which is the responsibility of the vehicle owner. The act provides that the emissions performance warranty is applicable only when a vehicle owner faces a sanction or penalty for an emission violation.

Conditions placed on implementation of the warranty program have limited its impact. The expenses involved in showing correlation with the certification test, and the limited applicability of the performance warranty, appear to be the greatest deterrents to full-scale adoption of the program.[21] Warranties may be more effectively used by EPA to supplement other state and local programs.

Other Programs

Still other programs are conducted by EPA to control mobile-source pollution. Section 203 of the Clean Air Act prohibits tampering with pollution-control devices (e.g., for the purpose of increasing fuel efficiency). EPA enforces this provision through surveillance, investigation, and prosecution. Because of the large number and wide distribution of service establishments, full enforcement would be very expensive.

EPA also has a mandate to ensure that all unleaded gasoline contains less than 0.05 grams of lead per gallon. This level is set so that catalytic converters may operate effectively. EPA's enforcement program has shown that there are very few violations of the lead content standard (0 to 2 percent) and that when they do occur, the lead content only slightly exceeds the standard.[22] A more serious problem is that auto owners are introducing leaded fuel into their tanks by adjusting tank openings. As the price differential between leaded and unleaded fuel increases, this problem grows in severity. If this practice becomes widespread, EPA may place higher priority on preventing improper use of leaded fuel by either service stations or vehicle owners, although at present there exists no legal penalty for violation by an auto owner.

In summary, Federal programs monitor the performance of motor vehicles from the early design phase through their lifetime on the road. Substantial resources from EPA, manufacturers, and the driving public have been committed to the programs, and emissions have been reduced markedly. Further reduction can be achieved through programs which are more localized in scope. The next section discusses such programs.

STATE AND LOCAL PROGRAMS

Even though they benefit from the national pollution control efforts, some parts of the country need (or may need in the future) to achieve further pollution reductions to comply with Federal standards. The Clean Air Act (as amended in 1977) provides two major tools for further emission reduction from mobile-sources: inspection/maintenance (I/M) programs; and transportation air-quality plans (also referred to as transportation control plans or TCPs).

Inspection/Maintenance Programs

I/M is an umbrella term for a variety of programs in which an owner tenders a vehicle to be tested for compliance with emission standards. EPA studies show that significant reductions in HC and CO emissions can be attained. Estimated reduction of these two pollutants range from a low of 8 percent to a high of 40 percent for the vehicles covered under an I/M program.[23]

I/M programs offer several benefits:

1. I/M can lessen emissions due to poor maintenance, misadjustment and tampering. These are difficult to address on a national basis once vehicles leave the manufacturer;
2. The localized nature of I/M makes it a flexible tool for achieving regional air quality goals. I/M thus helps meet goals of ambient air quality and compliance with vehicle emission standards;
3. I/M can provide useful data to EPA and other air pollution control agencies on emissions levels and technology effectiveness; and
4. I/M can serve as a basis for implementing warranty provisions.[24]

Despite these attributes, there are uncertainties and costs which detract from I/M's desirability. These include:

1. States' unwillingness or inability to provide the funds for initiating programs, giving publicity or training emission inspectors;
2. Uncertainty as to how much pollution reduction an I/M program can provide. Many effectiveness estimates rely on computer simulations and debatable assumptions regarding amounts of emissions between I/M tests. Empirical data that verify I/M effectiveness are limited; and
3. Public resistance to a program that might require people to pay out-of-pocket costs for vehicle repairs when the problem—poor emission performance—is not readily apparent to the driver. (Median repair costs have ranged from $8 to $20 per failed vehicle.)[25]

Only nine I/M programs were in operation prior to 1979.[26] The Clean Air Act amendments of 1977, however, place I/M on a stronger statutory footing; Section 172 mandates I/M programs as part of an area's air pollution control program if that area cannot otherwise meet ambient air quality standards for oxidants or carbon monoxide by December 31, 1982. This provision could result in an increase in the number of I/M programs throughout the country (though recent relaxation of the oxidant standard[27] makes the result uncertain).

Transportation Control Plans

Transportation Control Plans (TCPs) are prepared by states to coordinate their transportation and air quality planning efforts in preparing required State Implementation Plans for compliance with the National Ambient Air Quality Standards. EPA has suggested, and states have tried, various traffic and travel-control measures to reduce mobile source emissions. In the 1977 Clean Air Act Amendments, Congress called for adoption of "reasonably available" transportation control measures on the state or local scale to attain air quality standards. Transportation control measures are aimed at controlling traffic (both volume and travel behavior), not engine emissions. They have been directed primarily at passenger travel, especially work trips, and serve much the same function as DOT transportation system management (TSM) measures.

TCP measures include the following:

1. Transit service improvements—route and schedule modifications, express bus service, park-ride facilities, and transfer improvements to attract riders. Improvements and costs vary widely by region, from experimenting with low fares or expanding express bus service for commuters, to purchasing new fleets of buses or building rail systems;[28]
2. Preferential treatment for high-occupancy vehicles permitting buses and carpools to bypass congested roadways and improving travel times. Unless priority lanes effect significant diversion to high-occupancy vehicles, they have no perceptible effect on peak emissions. Capital costs can vary widely, from millions for a separate roadway to several thousand for traffic controls;[29]
3. Ride-sharing programs to encourage travelers to shift to carpools, such as: carpool matching programs; carpool parking priority; toll reduction; and vanpool programs. Significant reductions in vehicle miles of travel (VMT) can be achieved for low costs;[30]
4. Parking management (restrictions and fees for parking). Coupled with transit and carpool incentives, this can have a dramatic effect on traffic flow and VMT, although outright restrictions and surcharges are very unpopular. Costs for park-and-ride lots are nominal; parking programs may, in fact, generate municipal revenues;[31]
5. Pricing strategies, which involve fuel taxes, bridge tolls according to auto occupancy, or vehicle ownership taxes. These too are unpopular, but can yield significant VMT reductions.[32]
6. Traffic-flow improvements to reduce congestion, aimed primarily at CO hotspot problems. These include traffic signalization to improve speeds,

peak-period reversible lanes, and ramp metering onto freeways. Costs vary widely from very little to millions for some traffic signal projects.[33]

7. Commercial vehicle control to minimize trucking in commercial areas at rush-hour, including: on-street loading zones; off-street loading zones; peak-period restrictions of on-street loading; and truck route systems. Other than for special truck routes, which may be prohibitively expensive, the costs are nominal.[34]

In any sound implementation plan, comprehensive packages of complementary control measures would be undertaken. Analyses of the measures listed above indicate that regional emission reductions of less than 1 and up to 3 percent might result if they were implemented individually.[35] Reductions up to 9 percent could be expected through a comprehensive package approach.[36] Not all TCP measures are expensive, and effectiveness depends on political feasibility and enforceability.[37]

The programs described are directed at traffic control to curb mobile-source pollution, and are primarily for autos and other light-duty vehicles, trucks, and motorcycles. Aircraft pollution emissions are not yet regulated. (The major environmental concern with aircraft is noise pollution, which is discussed later in this chapter.) The 1977 Clean Air Act Amendments grant EPA authority to regulate aircraft emissions, requiring consultation with DOT to assure that standards present no hazard to aircraft safety.[38]

INDIRECT REGULATION OF MOBILE SOURCES

Provisions in the 1977 amendments ensure that areas not attaining national ambient standards are brought into compliance by 1983. All new or substantially modified stationary sources are required to secure a pre-construction permit and to demonstrate progress toward emission reduction. Construction permits for new industrial sources will be issued only if it is demonstrated that any increase in air pollution resulting from the new source is more than offset by emission reductions from existing sources beyond those levels required by the applicable State Implementation Plan.

Because a significant portion of the non-attainment problem in metropolitan areas is due to auto emissions (although varying significantly over different metropolitan regions), transportation controls and tradeoffs among new or modified industrial and transportation-related stationary sources are part of the strategy required of non-attainment areas. The difficulties surrounding the imposition of transportation controls in non-attainment areas are reflected in a provision of the 1977 amendments which extends the attainment deadline to as late as 1988 for areas with especially severe oxidant and carbon monoxide problems. State Implementation Plans for such areas must include all available measures to attain the primary standards. A schedule for implementation of a motor vehicle I/M program is also required. But the EPA Administrator is prohibited from requiring that states implement indirect-source review programs, except with respect to federally funded projects. States are free to adopt such programs voluntarily, however, and the Administrator is authorized to approve and enforce voluntary programs. If states fail to comply with requirements relating to non-attainment, they risk the cutoff of Federal aids.[39]

Another issue raised by the 1977 amendments is the provision of explicit statutory guidelines for regulation of industrial development that would cause air quality deterioration in areas where the air is currently better than the national ambient standards. Such regulations may inhibit synthetic fuel development and coal mining. These provisions are relevant to mobile-sources only insofar as states regulate the classified sources as indirect sources and restrict mobile-source access, or to the extent these sources themselves may be transportation-related, such as rural general aviation airports or pipeline pumping stations.[40]

PROGNOSIS THROUGH 2000

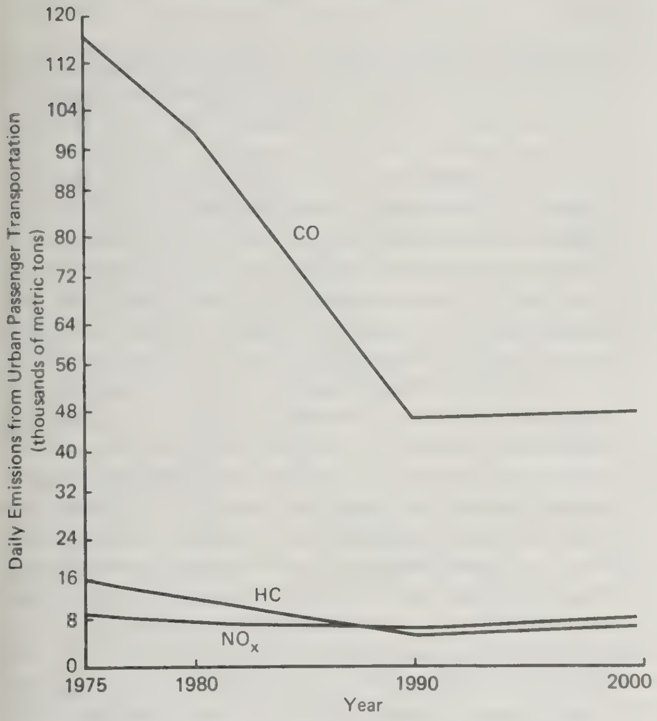
From the NTPSC's transportation activity forecasts, aggregate projections were derived of air pollutant emissions from mobile sources.[41] Personal passenger vehicles are the primary source of air pollution generated by transportation, particularly in urban areas. On a national basis, levels of pollution generated by urban personal passenger vehicles are forecast to continue to decline until 1990, and then to increase slightly due to increasing travel. Figure 11 and Appendix Table 19 illustrate the findings. There is special difficulty with NO_x emissions, due to growth in NO_x from coal burning at stationary sources. These emissions plus those from mobile sources may force postponements of certain U.S. air quality objectives.

NTPSC projections indicate substantial growth in intercity and international air transport. This may result in some increased emissions of air pollutants, if more aircraft operations offset the improvements to individual aircraft.

TRANSPORTATION NOISE

Federal recognition of transportation noise problems and involvement in noise regulation began with the

FIGURE 11. **Forecast urban transit emissions, 1975 to 2000, medium-growth scenario.**[a]



SOURCE: See Appendix Table 19.

[a]Forecast differences among scenarios are insignificant. Medium-growth values are used in plotting the Figure. This forecast was based on status quo policies of NO_x control, such that a primarily gasoline-powered auto fleet was assumed. Chapter 8 suggests dieselization is likely.

1968 amendment to the Federal Aviation Act that authorized the FAA to establish standards for the measurement of aircraft noise and sonic booms, and to issue regulations for noise control.[42] DOT was given authority to regulate noise from surface transportation in the Federal Highway Act of 1970.[43] A 1976 amendment to the Airport and Airway Development Act broadened Federal funding eligibility for airport projects to include the control of noise in the impact zone adjacent to airports.[44] Controversy surrounds the issue of Federal subsidy to individual manufacturers and carriers to retrofit the present air fleet to reduce noise. H.R. 8729, the Airport and Aircraft Noise Reduction Act considered in the 95th Congress, contained provisions for assistance to air carriers faced with the obsolescence of nearly three-fourths of their active fleet, through a series of surcharges on the users of air transportation.[45]

A number of significant noise sources for the future remain unregulated. Noise from the Concorde of the type already in operation is exempt from Federal Aviation Regulation (FAR) 36.[46] Such aircraft may not, however, exceed their current noise levels. Noise from the Concorde is louder than noise from most regulated subsonic aircraft, especially on departure.[47] Future SSTs, built after January 1, 1980, must adhere to FAR 36 standards.[48] General aviation noise remains largely unregulated. The large number of general aviation aircraft in comparison to aircraft operated by commercial carriers may constitute an obstacle to reducing noise at many airports. Finally, autos and light trucks, which are the most pervasive source of transportation noise, have not been subject to Federal noise control measures.

Despite the Noise Control Act of 1972, that authorized EPA to coordinate Federal noise programs,[49] the Federal role in controlling transportation noise remains unclear. On the one hand, the courts ruled that local airport operators bear liability for any aviation noise damage. On the other hand, Federal courts say the Federal government bears responsibility for regulating noise from local rail yard facilities.[50]

Responsibility for noise control is divided among various Federal agencies. EPA's responsibility to propose noise standards to FAA, which sets aircraft noise regulations, is likely to remain an issue. Many have argued EPA should have sole responsibility for noise regulations in all modes, while others feel FAA should continue to set noise rules because of safety and other concerns.[51] A division of responsibility also exists between EPA, which sets surface transportation noise regulations for interstate motor carrier and railroad operations, and the U.S. DOT, which enforces them.[52] At the local level, conflicts between various jurisdictions are a major impediment to reducing harmful aviation noise.[53]

The costs of compliance with Federal noise regulations are twofold. The monetary costs of financing compliance with noise regulations are large. The low rate of return of the airlines in the early 1970s made it difficult for air carriers to finance replacement or retrofit of noisy aircraft in order to comply with Federal regulations. A similar problem now exists in the rail industry. Railroads in financial difficulty may not wish to purchase low-noise equipment. Also, firms in the bus and motorcycle industries may not easily afford the changes required by Federal noise regulations.

There may also be safety costs associated with noise regulation compliance, to the extent that there are tradeoffs between safety and technological or procedural solutions to noise problems. With respect to aircraft noise, proposed procedural changes of reducing air speed immediately after takeoff while within a certain proximity to the ground may have safety risks.[54]

Although improved fuel efficiency and noise reduction may go hand in hand, in other instances there are trade-offs to be made between less noise and less fuel consumption. The cost of many technological improvements appears to be an obstacle to realizing both noise reduction and fuel efficiency for aircraft operations.

The optimal noise abatement strategy remains unclear. Lack of definitive information on impacts of noise, technologicial feasibility of noise control measures and their economic costs, and localized estimates of future travel and population growth make it difficult to determine with certainty the best control strategy. More effective regulation of transportation noise will require information on the incremental costs and benefits of reducing noise.

HAZARDOUS MATERIALS TRANSPORTATION

The substances currently designated hazardous by EPA include some industrial and municipal wastes, chemicals, petroleum and related fuel products, and toxic substances.[55] A summary follows of the pertinent legislation and the issues that emerge from control over these substances. Not included in this discussion, but covered later under transportation safety, are explosives (regulated by the DOT) and radioactive materials (regulated by the Nuclear Regulatory Commission).

The Resource Conservation and Recovery Act of 1976 (RCR Act) gives EPA authority to regulate waste materials which are designated hazardous.[56] As of mid-1979, EPA had not completed the technical documentation of the materials which will eventually be subject to regulation. Key provisions of the RCR Act involve the development of criteria to determine which wastes are hazardous; institution of a transport tracking system; and establishment of a permit system for hazardous waste treatment, storage, and disposal.

The RCR Act was not intended to set restrictions on the transport modes carrying hazardous substances. Its regulations require only clerical duties of recordkeeping and placarding vehicles. As these functions are already performed by the transporters under DOT safety regulations, RCR Act regulations will be of insignificant direct impact to the transport sector. The RCR Act does mandate that EPA develop regulations for disposal practices and designated disposal sites.[57] Thus, RCR Act regulations will likely increase the demand for transportation services if on-site disposal is displaced, primarily in the rail, barge and truck modes.

The Toxic Substances Control Act of 1976 (TSC Act) restricts disposal of toxic materials at regulated sites.[58] Similar to RCR Act regulations, the TSC Act can be expected to increase demand for transportation services, primarily by truck, for disposal of toxic wastes in approved sites.

Regulatory control of petroleum and hazardous substance spills falls under the authority of several statutes.

1. The Clean Water Act of 1977, Section 311, grants EPA authority to develop and enforce penalties for spills of petroleum and hazardous substances.[59] Penalties, based on technical evidence of spill removability, quantity released, and extent of damage, were developed by EPA. In one case, transporters sought judicial relief from the penalties and won. The court found EPA's technical support inadequate, and the liability to the transporters (mostly barges) for the penalties uninsurable. The plaintiffs argued that the penalties had the potential for putting some small barge operators out of business and severely restricted the types of cargo carried by other operators. Presently the Section 311 regulations are in abeyance.[60] It is possible that EPA will lower the penalties and strengthen its technical evidence.
2. Through international treaties and conventions, the provisions of the Oil Pollution Prevention Act of 1961[61] and the Ports and Waterways Safety Act of 1972, as amended in 1978,[62] the U.S. has developed guidelines and agreements for tanker construction, operation, navigation, and manning. The Coast Guard issues these regulations.

There has been recent activity in Congress toward creating a "superfund" to pay for oil spill clean-up. Bills introduced in the 95th Congress differed in provisions on: the fees to create a fund; the size of a fund; pre-emption of state charges; liability limits; the inclusion of certain hazardous substances; and the question of insurability.[63] If pre-emption of state funds is not part of a bill, shipments may be more costly to customers in states where additional state fees are charged. The shipping industry favors pre-emption by the Federal government, exclusion of certain hazardous materials, and minimal liability limits.[64]

WATER POLLUTION

The Federal Water Pollution Control Act of 1972[65] (FWPC Act) reorganized the ways in which water quality goals are to be achieved in the U.S.[66] Besides increasing the authority of the Army Corps of Engineers over the regulation of water quality, the FWPC Act charged EPA with major Federal responsiblity for water quality protection. Section 404 of the act pertains to dredged and fill material disposal, indicating that:

1. The Corps issues permits, after public hearings, for the disposal of dredged material in navigable waters at specific disposal sites;

2. Dumping sites be specified by the Corps using guidelines developed by EPA; and
3. EPA may veto the Corps' designation of disposal sites if EPA determines that the proposed discharges may have adverse effects on water supplies, shellfish beds, fishery areas, wildlife or recreation areas.[67]

Considerable controversy and litigation over the extent of the Corps' jurisdiction ensued. Since 1972, the definition of "navigable waters" has been increasingly specified. A 1974 suit, brought by the Natural Resources Defense Council against the Corps, claiming that the Corps had improperly limited its jurisdiction to less-restrictive definitions of navigable waters, and that Congress intended to expand jurisdiction for the disposal of dredged and fill material to protect dwindling coastal marshes and inland wetlands, was decided in favor of the plaintiffs in 1975.[68] The Corps accordingly was directed, in cooperation with EPA, to prepare proposed regulations expanding its interpretation of which waterways would be protected by permit. Regulations issued in July 1975 extended the Corps' jurisdiction under Section 404 in a three-phase program to include wetlands, primary and secondary tributaries of navigable waters, and natural lakes greater than five acres in surface area.

The Clean Water Act of 1977, enacted December 27, 1977,[69] consists of fine-tuning amendments to the FWPC Act. The 1977 Act continues the broad Federal jurisdiction over U.S. waters and wetlands contained in the 1972 Act, expanded by the 1975 court decision, but provides a mechanism for establishing state permit programs for controlling the disposal of dredge and fill materials into many water and wetland areas. Amended Section 404 limits the requirement for a permit to navigable waters and adjacent wetlands. If the Secretary of the Army and the Governor of any state see the need for regulation of discharge to non-navigable waters and adjacent wetlands, an expanded regulatory program may be undertaken by the Corps. Section 404 was further amended to provide exemptions from permit requirements for activities such as: normal farming, silvicultural and ranching activities; certain construction and maintenance activities; Federal activities for which an environmental impact statement has been provided; and those activities already regulated by the states under other provisions of the 1972 Act.[70] The Clean Water Act of 1977 also provides for the limited use of nationwide and general permits, to eliminate administrative delay by not requiring individual permits for certain discharges that cause minimal environmental harm.[71]

Controversy continues over the Corps' dredging practices. In a case involving Lock and Dam #26 on the Mississippi River at Alton, Illinois, a District Court ruled that an inadequate environmental analysis had been conducted of, among other things, the impacts of proposed dredging and dredge disposal to deepen the lock for larger barges.[72]

According to a recent survey of U.S. ports by the Maritime Administration, dredge spoil disposal and containment regulations threaten the existence of some ports and the development of new or deeper ports.[73] Results of the survey imply that Section 404 is the most substantial environmental protection restriction affecting port operations and development and involves all levels of government in a complex land-use, water-quality dilemma. The cost for the provision of dredge-spoil disposal sites is to be borne by local ports, although dredging is performed under Corps of Engineers auspices.[74]

From the MarAd survey, covering 81 ports, the cost of compliance with environmental regulations was estimated and compared with the costs of complying with other Federal regulations (in employee health and safety, and cargo protection) affecting port development and operations. From 1970 to 1976, total public port expenditures related to all regulation were $194 million, of which 56 percent was spent on environmental protection regulations. Approximately 11 percent of these environmental protection expenditures involved dredge spoils disposal. Second to expenditures on design of water-quality treatment facilities, spoils disposal presented the largest cost item to these ports for compliance with Federal regulations.[75] To applicants for dredge and fill material disposal permits, permit approval delays (involving approval of dumpsites and means of transport and containment), and significantly higher costs may be the result of these regulations.[76] Apparently the benefits are unstudied.

TRANSPORTATION AND THE EIS PROCEDURE

The National Environmental Policy Act of 1969 (NEPA) is complex and has a major impact on transportation. Section 102(c) of NEPA requires recommendations or reports on proposals for legislation, and other major Federal actions significantly affecting the quality of the human environmment, to include a detailed environmental impact statement (EIS) by the responsible official.[77] This section has affected the actions of nearly every Federal agency, actions involving Federal lands or Federal funds, and all major developments (including facility rehabilitation and reconstruction) planned since 1970. All sections of NEPA were phrased in very general and sweeping terms and much confusion about its requirements has ensued.

The preparation of EISs has introduced costs and resulted in project delays, although unevenly because compliance with the goals and procedures of NEPA has varied with each agency depending on the nature of its programs—whether primarily grants, permits, land management, construction, or regulation—and on the amount of NEPA litigation experienced or perceived as likely by the agency.[78] Although NEPA compliance involves more than the EIS process, the EIS record is perceived as the best measure of the extent to which an agency complies with NEPA's other procedural requirements and seeks to implement NEPA's broad goals.[79]

By Executive Order, in May 1977, President Carter directed the Council on Environmental Quality (CEQ) to issue regulations, binding on all Federal agencies, to implement NEPA and guide the EIS process.[80] Final regulations for implementing procedural provisions of NEPA were issued by CEQ on November 29, 1978.[81] Implementing procedures are being drawn up by all Federal agencies as required in the regulations, and were to be submitted to CEQ in April 1979.[82] Until now, agencies have developed their EIS procedures in accordance with CEQ guidelines, but under no specific regulations.

CEQ's proposed regulations have two notable provisions. One requires evaluation of the most "environmentally preferable" alternative, with public involvement. Then a "record of decision" document must be filed, explaining whether the alternative adopted was that of environmental preference, and why.[83] The second requires that agencies cooperate before drafting an EIS, and consult over specific, controversial requirements of an action; this regulation requires objections to an EIS to be made earlier in the process.[84]

It was calculated that DOT spent $36 million in FY 1975 alone on EIS preparation, review and comment, covering an estimated 205 statements.[85] This figure is not all-inclusive, however, as many transportation EIS responsibilities fall under the jurisdiction of other Federal agencies or state and local governments.

Delays have resulted from administrative inefficiencies in completing environmental analyses and from court orders delaying projects until NEPA analyses were made. Costs, in delay and money, are alleged to have been substantial in the case of two transport activities—new pipeline development and port expansion and development.[86] Many agencies, and DOT in particular, have no established method of determining NEPA costs (the costs are a part of their administrative procedures).

Other substantial costs related to NEPA have occurred in highway programs. Due to lack of a "grandfather clause," impact statements were required for projects that were underway prior to NEPA, and for projects approved but not yet begun. In 1971, DOT filed 1,293 draft EISs.[87] By 1972, DOT began to catch up, as pre-NEPA projects went through the NEPA process and as small highway segments were consolidated into fewer impact statements. By 1975, less than 9 percent of all highway projects required EISs under DOT's NEPA criteria.[88]

TRANSPORTATION SAFETY

In addition to environmental externalities, transportation poses hazards. Figure 12 exhibits fatality data for the several modes; by far the greatest number of deaths involve motor vehicle traffic. The NTPSC reviewed safety problems of public for-hire passenger carriers and freight carriers, finding no major intermodal shifts among the for-hire modes that would radically change the emphasis or nature of safety programs.

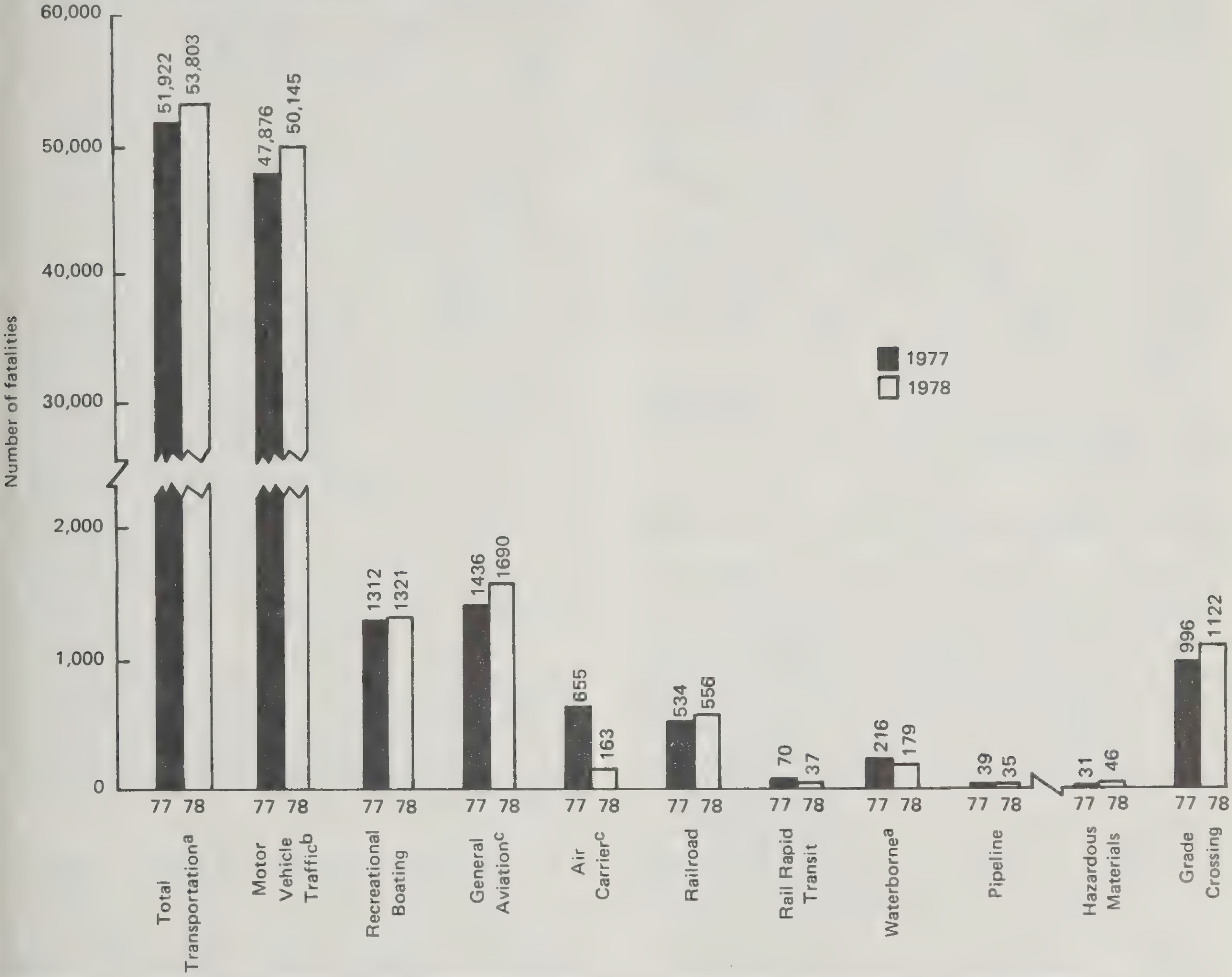
Simply put, transportation safety involves the prevention of accidents and the minimization of loss from accidents that may occur. Safety promotion has required the development, implementation, and evaluation of extensive Federal and state safety programs, involving:

1. Safety of public and private vehicles when using shared highways, waterways and airways;
2. Securing of public carrier passengers from injury or death due to any aspect of vehicle operation;
3. Safety of carrier employees in their place of work and during their course of duty; and
4. Safety of bystanders (as persons and as property owners) from all types of accident hazards due to vehicles or crafts leaving their established "ways."

Programs to meet safety needs are an amalgam of: provision of facilities (lighthouses, for instance); provision of services (air navigation and traffic control); regulation of suppliers (by state highway departments and through Federal standards); and regulation of vehicle operators (motor-carrier safety regulation). The total annual cost of Federal programs exceeds $4.5 billion per year.[89]

In addition to public agencies, private organizations have roles in transportation safety. For example, the National Fire Protection Association, a private organization devoted to fire safety, has prepared and issued standards for handling, transporting, and storing highly volatile substances, such as gasoline and heating oils. These standards are sometimes adopted and given force of law by state or Federal agencies.[90] The Association of American Railroads has been responsible for many railroad operating rules and for equipment interchange specifications, particularly relating to car couplers and brakes.[91]

FIGURE 12. Transportation fatalities by mode, 1977 and 1978.



SOURCE: U.S. Department of Transportation, *Transportation Safety Information Report*, Washington, D.C.: March 1979, p. 2.

[a] Waterborne transportation (reported on a fiscal-year basis) is not included in total transportation.

[b] Based on a 30-day fatality definition. 1978 data are preliminary (as of 1/30/79).

[c] General aviation and air carrier each include 144 fatalities resulting from mid-air collision over San Diego, California. However, these fatalities are counted only once in the total transportation figure.

Safety legislation has usually been a response by state or Federal legislators to conditions which were not being rectified thoroughly or soon enough by transportation service operators. Safety regulations are frequently viewed by operators as costing money unnecessarily. The need for safe operation is recognized, but the standards and procedures for obtaining them are often contested by operators.

The first item of Federal railroad safety regulation is a classic case. Passed in 1893, this act required the installation of air brakes on freight trains to replace hand braking on each car.[92] The manual system was accident prone and dangerous to employees. A power braking system had been available since its first passenger train application in 1868, 25 years prior to congressional action.[93] In an era of trackage expansion, air brake installation and retrofitting had to compete with other expenditures and brakes were not always given priority.

Today, with variable levels of enforcement from state to state,[94] options for eluding enforcement of safety regulations include, for example, truck drivers exceeding regulated hours to earn more money, or stretching the life of tires beyond maximum allowable tread wear to reduce expenses. That is, the practices legislated against by both Congress and state legislatures may persist because of the cost and political repercussions of enforcement.

Most safety improvements require the use of resources, either public or private. To assess the effectiveness of safety expenditures, economic measures such as the internal rate of return can be applied, assuming agreement on the approximate value of life and limb. Such calculations have been carried out in the U.S., but not necessarily used. A NHTSA report to Congress did present data on the cost, per fatality forestalled, for a variety of highway traffic accident countermeasures.[95] Appendix Table 20 ranks countermeasures by cost effectiveness. Economic analysis of this type should be applied to proposed countermeasures.

Contemporary public-carrier safety issues may be grouped in four categories, as described below. These issues have received public and private attention, but specific problems persist.

QUALIFICATION AND FITNESS OF OPERATORS

Accident investigation reports often indicate that operators—singly or as crew members—are solely or largely responsible.[96] Better supervision and higher-caliber employees should improve safety. Fatigue, apathy, lack of alertness, failure to adhere to established operating rules, inattention, or use of alcohol and drugs are all involved. Almost all public passenger and freight-carrier operations require repetitive trips or runs over the same route. No matter what the mode, the trip may become routine and boring, alertness is not maintained, and discipline breaks down. Only the tightest kind of supervision can reduce these hazards which are common to all transport. The alertness problem does not appear amenable to further regulation but may be affected by heavy civil or criminal penalties when disclosed, as in an accident report. For any mode, improvement in the on-duty performance of operators and crew members appears obtainable only through increased supervision. While higher outlays for supervision will be unlikely to increase capacity or efficiency to a measurable degree, or even to significantly reduce insurance costs, such operating cost increases are unlikely to exceed two or three percent.

Lack of technical qualification on the part of operating personnel appears a problem with some foreign-flag vessels.[97] Tightening crew qualifications might increase cost. The potential effect on U.S. import-export traffic appears nominal.

PHYSICAL CONDITION OF RIGHTS-OF-WAY AND VEHICLES

Deterioration of rail track and structures due to deferred maintenance and, to a lesser extent, deterioration of older highways and road bridges, are primary causes of accidents. Train service accidents, largely derailments, have increased in dollar terms by about 50 percent in the last 10 years.[98]

Deferral of railroad maintenance, which affects cars and locomotives as well as track, is essentially a financial problem of insufficient revenues for many carriers. Its solution is likely to be difficult and time-consuming, and conditions will worsen further before a turnaround occurs. Deferred maintenance of rail plant and equipment was estimated at over $4 billion in 1976 by the FRA.[99]

Deteriorated vehicle conditions appear to be serious among trucks, for which brake deficiencies and excessive tire wear are safety problems.[100] Freight car and locomotive maintenance have also been underfunded on many rail properties.[101] Accident reports, particularly for trucks, have shown that improved brake and tire conditions should measurably reduce the number and severity of accidents.[102] Deficiencies are found to some extent among all types of operators.[103] While these problems are in part financial, they may be corrected through third-party inspection programs and enforced removal of vehicles from service by state or Federal inspectors.

The hazards of highway accidents have been lessened by removing fixed obstructions from the margins, widening lanes and rights-of-way, improving sight distances, changing guard-rail designs, and so forth. Both airways and waterways are being scrutinized for changes that would reduce collisions in the vicinity of terminal areas.

SOURCES AND METHODS OF ENFORCEMENT

Safety enforcement problems for the highway and railway modes revolve around the limited scope of inspection programs and the variety of actions among the states. Under the federal system of government, states have had wide latitude in the use of police powers. Efforts by FHWA and other DOT agencies to improve state performance have had uneven results although in some cases receipt of highway capital grants has been made contingent by Congress on state operation of such programs as anti-alcohol enforcement, driver education, and emergency medical services.[104]

States have used a variety of methods for truck safety enforcement. Many have combined safety enforcement with enforcement of economic regulations (prevention of illegal carriage by unauthorized operators) or with truck weight enforcement at truck scales. Other states use state police forces to inspect trucks and buses, either at fixed or random locations.

Accident reporting (except for aviation and rail) is generally the concern of state and local government.

This process is so lacking in uniformity that there are no national statistical bases from which to measure any changes due to program actions. Truck accident reporting, to date, is less complete than for light-duty vehicles, which have been subject to recent attention by U.S. DOT agencies.[105]

HAZARDOUS MATERIALS HANDLING AND ACCIDENTS

The volume and variety of substances which are highly inflammable, explosive, toxic, or radioactive (either in natural states, under stress of an accident, or when accidentally combined with other materials) have rapidly increased. Recent catastrophic accidents on the railways and highways have pushed this problem to the fore. The emergency forces on the scene are often rural or small-town fire and police forces with little technical understanding of the materials' behavior except for such common substances as refined petroleum products or industrial acids.[106] They also often do not know the exact contents of overturned or ruptured rail cars or trucks. Lack of handling knowledge has apparently caused secondary explosions during wreckage-clearing operations.[107]

As a result, industry is taking steps both to reduce the chances of accidents involving hazardous materials and to minimize the consequences should such accidents occur. For example, the Manufacturing Chemists Association has established a Chemical Transportation Emergency Center (Chemtrec), which is available on a 24-hour basis to provide emergency response information and to contact shippers whose hazardous commodities are involved in an accident.[108] An Inter-Industry Task Force on Rail Transportation of Hazardous Materials, comprised of railroad, rail-car manufacturer, and shipper representatives, has been formed to accelerate present programs and take steps to reduce the number and severity of rail accidents involving hazardous materials by installing sophisticated failure detection systems that identify defects in rail equipment or track before they cause accidents. The industry has agreed to special handling which restricts switching and speed for trains containing hazardous materials. Company specialists trained to handle hazardous materials are available to deal with emergencies and to instruct firefighters in cities and towns located along rail rights-of-way. In addition, most firms are placing emergency response information on trains handling hazardous materials.[109]

Increased protective strength of vehicles in case of collision has been required by regulation in the past, and by a recent mandatory action by the Secretary of Transportation for railroad tank cars.[110] It appears likely that the problem of accidents with rail cars, trucks, barges, or ships containing hazardous materials will continue to be met, in part, by revising and tightening design specifications of both packaging and vehicles. This appears to be one of the more immediate practical actions the Federal government can take.

SUMMARY AND CONCLUSION

Interrelations between the transportation system and the externalities of its operation—environment and safety—are complex; numerous regulations affect all modes and markets. NTPSC forecasts suggest that environmental and safety issues will persist over the next two decades, but with greater attention to economic and energy-resource pressures.

Mobile-source air pollution regulation has had perhaps the most pervasive impact on transportation of any externality. The latest regulations extend deadlines for air quality improvement but impose stricter standards and regulate more vehicles. Emission levels are predicted to start rising slightly after 1990, primarily due to steady growth in motor vehicle traffic (due, in large part, to the increased driving-age population). Widespread operation of the diesel engine, which offers significant potential for energy savings, will depend on NO_x and proposed particulate standards. Many emission-control strategies are costly to implement, but may be adopted when they can be shown to achieve other goals simultaneously (e.g., energy efficiency).

Institutional conflicts are embodied in the Federal noise program through divided responsibility for noise control among various agencies. The costs of compliance with noise regulations may be large and involve safety tradeoffs.

Regulations now exist for the transport of industrial and municipal waste, chemicals, petroleum and related fuel products, and other toxic substances. Liability for compliance and cost are still issues to be resolved. If on-site disposal is displaced, RCR Act regulations for hazardous waste disposal could increase the demand for transport of these materials, primarily in the rail, barge, and truck modes.

Interpretation of the Federal Water Pollution Control Act's dredge and fill provisions (Section 404) has substantially expanded Army Corps of Engineers jurisdiction over U.S. waterways. The regulations impose costs on new port development or expansion of existing operations, while benefits are unmeasured.

NEPA requirements for EIS submittal, even as modified by recent CEQ regulations, may pose problems of delay or increased cost to new transportation development. Again, the benefits of such regulations are often unmeasured.

Historically, the environmental consequences of transportation activities have been ignored or misunderstood. Until perhaps the last decade, environmental concern over transportation activity has been slight. The last decade witnessed a proliferation of environmental regulations, many with severe cost or operational consequences for transportation. In a recently published survey of environmental attitudes, Kathryn Utrup, of Resources for the Future, concludes that ". . . even though economic and energy resource pressures have increased, the public maintains a continued strong commitment to environmental quality."[111] She compared major national surveys on environmental issues, covering the period from 1960 to 1978, focusing on how the public views the amount of Federal money spent on environmental protection, and found that strong support exists in all segments of American society.[112]

Nevertheless, environmental endeavors compete for limited resources, and allocating resources to one activity may work at cross-purposes with respect to the others.[113] Clearly the next decade, and perhaps the following one, will see continued economic and energy pressures, as experienced in the latter half of the 1970s. In some cases, these competing pressures may take precedence over environmental values.

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3. HC is a chemical precursor of photochemical oxidants.
4. U.S. Council on Environmental Quality (CEQ), *Environmental Quality: Ninth Annual Report*, Washington, D.C.: Government Printing Office, 1979, pp. 62–66.
5. U.S. Environmental Protection Agency, "Cost Effectiveness and Feasibility of Selected Transportation Control Plan (TCP) Strategies to Reduce Oxidant Air Pollution: Policy Summary," unpublished staff report by Edward Bentz, Washington, D.C.: 1977.
6. Clean Air Act of 1970, 42 U.S.C. Section 1857 (1975).
7. Standards for motor vehicles, as they stand under the 1977 amendments to the Act, are shown in U.S. Environmental Protection Agency, *Progress in the Prevention and Control of Air Pollution in 1977*, Washington, D.C.: 1977, pp. 60–61. (Hereafter cited as EPA, *Progress in the Prevention and Control of Air Pollution.*)
8. Clean Air Act Amendments of 1977, 42 U.S.C. Section 7401 *et seq.* (1978).
9. U.S. Environmental Protection Agency, *Appendix N to 40 CFR Part 51: Emission Reductions Achievable Through Inspection and Maintenance of Light-Duty Vehicles, Motorcycles, and Light and Heavy-Duty Trucks*, Washington, D.C.: 1977, p. 3–3.
10. "Diesel cars emit between 30 to 70 times as many particulates as catalyst-equipped gasoline-powered cars. Particulates emitted from diesel cars are small in size and can penetrate deeply into the lungs . . . .We are conducting health-effects research to determine if this pollutant can cause cancer. However, the standards being proposed are not based on any such effect," according to EPA Administrator Douglas Costle. See Larry Kramer, "Diesel Exhaust Rules Set Stage for Fights," *Washington Post*, 11 January 1979, p. D9.

    EPA recently proposed new standards for particulate emission controls in diesel-fueled cars and trucks. The standards would set maximum emissions from 1981 model diesel cars at 0.6 grams per mile, dropping to 0.2 grams for the 1983 and later model years. In contrast, EPA estimates General Motor's 1979 diesel-powered Oldsmobile emits 0.78 to 1.02 grams/mile; the VW Rabbit emits 0.23 grams/mile; and Mercedes' diesel model emits from 0.45 to 0.83 grams/mile.

    In 1979, EPA is undertaking a $9.5 million research program on diesel emissions. This research will cover not only health effects, but also control technology, and instrumentation and methods development. The health effects research will include invitro testing, toxicology work with animals, and epidemiology. An article in *Environment Reporter* ("EPA Initiates $9.5 Million Program to Study Effects of Diesel Exhaust"), dated November 10, 1978, quotes the following from a draft EPA "Mobile Sources Research Plan":

    > ". . . recent test results and the usual carcinogenic properties of soot from incompletely burned organic material have raised the question of whether particles emitted from diesel engines are carcinogenic."

    Further, according to Ronald Bradow, EPA's Chief of the Mobile Source Emissions Research Branch:

    > "What we found out was that certain fractions of samples of the diesel exhaust organic material had an awful lot of activity, and some of these were fractions we wouldn't have anticipated would have been active at all . . . ."

    The entire research program will take several years, although parts of the program will yield earlier results.

    Additional discussion of potential health problems associated with diesel can be found in an article by Brian Ketcham and Stan Pinkwas, "Diesels and Man," *New Engineer*, April 1978, pp. 23–32.
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12. E. G. Barry, F. J. Hills, A. Ramella, and R. B. Smith, "If Autos Go to Diesel Fuel," *Hydrocarbon Processing*, May 1977, p. 115.
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18. See U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines: Selective Enforcement Auditing Procedures," *Federal Register,* 28 July 1976, p. 31475. This SEA program has been estimated to cost manufacturers between $200,000 and $600,000 annually for administrative costs alone. This, plus costs for design changes, testing and adjustments to equipment, translates into a 0.2 percent increase in sticker price to consumers. U.S. Environmental Protection Agency, "Economic Impact of Selective Enforcement Audit Regulations," unpublished draft report by Tom J. Alexander, Washington, D.C.: 1976.
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26. *Wall Street Journal,* 24 April 1979, p. 15.
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47. The following table displays Concorde noise levels, compared with noise levels from selected subsonic aircraft, on departures and arrivals at Dulles International Airport, Washington, D.C.:

Aircraft Type	Departure Noise Level (EPNdB)	Arrival Noise Level (EPNdB)
Concorde	119.3	116.6
Boeing 727	104.3	107.7
Boeing 707	111.3	117.3
Boeing 747	108.2	115.0
DC–8	111.7	116.6
DC–9	101.3	109.0

These data were gathered from U.S. Department of Transportation, *Concorde Monitoring Monthly Report,* Washington, D.C., May 1977; and from data on initial Concorde trials (1975–1977) reported in U.S. General Accounting Office, *The Concorde—Results of a Supersonic Aircraft's Entry into the U.S.,* Washington, D.C.: 1977. (Hereafter cited as CEQ, *Ninth Annual Report.*)

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58. Toxic Substances Control Act of 1976, 15 U.S.C. Section 2601 *et seq.* (1978), 90 Stat. 2003.
59. Federal Water Pollution Control Act, Section 311, 33 U.S.C. Section 1321 (1978), amending the Clean Water Act of 1977, 49 U.S.C. Section 1321 (1978).
60. *Manufacturing Chemists Association v. Costle,* 455 F. Supp. 968 (W.D. La. 1978).
61. Oil Pollution Act, 1961, Pub. L. 87–167, 75 Stat. 402 (1961).
62. Ports and Waterways Safety Act of 1972, 46 U.S.C. Section 391(a)(1978).
63. Major legislation on this issue before the 95th Congress included: S.1187, Comprehensive Oil Spill Liability and Compensation Act; S. 2083, Oil Pollution Liability and Compensation Act; H.R. 6803, Comprehensive Oil Spill Liability and Compensation Act; and S. 2900, Oil Spill Liability Fund and Compensation Act. For highlights of bill provisions and legislative action, see CEQ, *Environmental Quality: Ninth Annual Report,* pp. 368–369.
64. CEQ, *Ninth Annual Report,* pp. 368–369.
65. Federal Water Pollution Control Act, 33 U.S.C. Section 1251, *et seq.* (1978).
66. U.S. Congressional Research Service (CRS), *Environmental Protection: Legislation and Programs of the Environmental Protection Agency,* by John E. Blodgett and Mark E. Anthony, Washington, D.C.: 1977, p. 2–CRS–1.
67. U.S. Maritime Administration, Region IX Office, *Untangling Dredging Regulations,* San Francisco: 1976, pp. 12–13.
68. U.S. Congressional Research Service, *Water Pollution Control: Disposal of Dredge and Fill,* by Malcolm Simmons, Issue Brief No. 77026, Washington, D.C.: 1978, p. CRS–7.
69. Clean Water Act of 1977, 33 U.S.C. Section 1251, *et seq.* (1978), amending 33 U.S.C. Section 1251, *et seq.* (1977).
70. Federal Water Pollution Control Act, 33 U.S.C. Section 1251, *et seq.* (1978).
71. Nationwide permits are issued by the Corps' headquarters office, while general permits are issued by district offices. Safeguards are included in the regulations to ensure that the nationwide permit system does not adversely affect water quality.
72. "Environmental Fight May Curtail Dredging on Upper Mississippi," *Traffic World,* 27 March 1978, p. 16.
73. U.S. Maritime Administration, *The Effect of Federal Standards on U.S. Public Port Development,* Washington, D.C.: 1978, p. 15.
74. *Ibid.*
75. *Ibid.,* Table 8, p. 34.
76. *Ibid.,* pp. 50–53.
77. National Environmental Policy Act of 1969, Pub. L. 91–190, 83 Stat. 852 (1969).
78. U.S. Council on Environmental Quality (CEQ), *Environmental Quality: Sixth Annual Report,* Washington, D.C.: Government Printing Office, 1976, p. 627. (Hereafter cited as CEQ, *Sixth Annual Report.*)
79. *Ibid.,* p. 628.
80. 42 Fed. Reg. 26967 (1977), amending Executive Order 11514 (1970). See discussion of NEPA and regulations in CEQ, *Eighth Annual Report,* pp. 396–415.
81. U.S. Council on Environmental Quality, "National Environmental Policy Act: Implementation of Procedural Provisions: Final Regulations," *Federal Register* 43 (29 November 1978), p. 56003.
82. *Ibid.*
83. Michael Kane, Transportation and Land Use Division, Council on Environmental Quality, Washington, D.C., telephone interview, March 1979.
84. *Ibid.*
85. CEQ, *Sixth Annual Report,* pp. 636–637.
86. "A Legacy in the Making," *Marathon World,* No. 4, 1977, pp. 20–23.
87. CEQ, *Sixth Annual Report,* p. 639.
88. *Ibid.,* p. 638.
89. Estimates from agency budgets are shown below.

Department of Transportation	Safety Budgets (Billions of $)
FHWA & NHTSA	1.200
FRA	0.030
FAA	2.500
CG	0.900
MTB	0.005
TOTAL	$4.635

See, U.S. Office of Management and Budget, *The Budget of the United States Government, Fiscal Year 1977,* Washington, D.C.: Government Printing Office, 1976; and U.S. Congressional Budget Office, *1979 Congressional Budget Scorekeeping Report,* Report No. 4, Washington, D.C.: Government Printing Office, 1978.

90. Herbert Colcord, Office of Public Information, National Fire Protection Association, Boston, Massachusetts, telephone interview, 13 April 1979.
91. See, for example, the following Association of American Railroad publications: *Standard Code of Operating Rules,* Washington, D.C.: 1965; and *Manual of Standards and Recommended Practices,* Chicago, Illinois: (revised to 1978).
92. Safety Appliance Acts, 45 U.S.C. Section 1 *et seq.* (1964).
93. Dudley F. Pegrum, *Transportation: Economics and Public Policy,* Homewood, Ill.: Richard D. Irwin, Inc., 1973.
94. For information on the variations in state performance, see: H. J. Anderson, "The Federal Approach to Highway Safety," in *Compendium of Technical Papers, Institute of Transportation Engineers, 48th Annual Meeting,* held in Atlanta, Ga. on August 8, 1978, Arlington, Va.: Institute of Transportation Engineers, 1978.
95. National Highway Traffic Safety Administration (NHTSA), *The National Highway Safety Needs Report,* Washington, D.C.: 1976.
96. See National Transportation Safety Board summaries of accident investigations in U.S. Department of Transportation, Transportation Systems Center, *Transportation Safety Information Report,* Cambridge, Massachusetts: quarterly. (Hereafter cited as DOT, *Transportation Safety Information Report.*)
97. James R. McCaul, President, International Maritime Associates, Washington, D.C., telephone interview, 27 April 1979.
98. DOT, *Transportation Safety Information Report,* March 1978, p. 84. Also, it should be noted that reportable accidents, for all modes, are often defined by a dollar cutoff of estimated damage. Inflation alone makes more accidents "reportable" each year. Further, rail accident experience appears to differ greatly by line and rail property.
99. U.S. Federal Railroad Administration (FRA), *A Prospectus for Change in the Freight Railroad Industry,* Washington, D.C.: 1978, p. 24. (Hereafter cited as FRA, *A Prospectus for Change.*)
100. See discussion of roadside truck inspections in U.S. DOT, *Transportation Safety Information Report,* March 1978, pp. 88–93.

101. FRA, *A Prospectus for Change*, p. 24.
102. See DOT, *Transportation Safety Information Report* for summaries of accident investigations.
103. *Ibid.* Both public budgets and private maintenance expenses would be increased by unknown amounts with more extensive safety inspection programs. Although there appear to be no accepted cost figures for added inspection, best NTPSC estimates suggest a range from $500 to 800 million per year on a national basis. It is not clear whether the benefits of accident reductions would justify such outlays.
104. U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), *National Highway Safety Report*, Washington, D.C.: 1976, Chapter III.
105. Sally Adams, Staff, Senate Committee on Commerce, Science, and Transportation, Washington, D.C., telephone interview, 27 April 1979.
106. DOT, *Transportation Safety Information Report*, June 1978, p. 45.
107. *Ibid.*
108. See account of Waverly, Tenn. accident in DOT, *Transportation Safety Information Report*, September 1978, p. 49.
109. U.S. Office of Technology Assessment, *An Evaluation of Railroad Safety*, Washington, D.C.: 1978, p. 144.
110. U.S. Department of Transportation, Materials Transportation Bureau, "Docket No. HM–144, Amend. No. 179–24," *Federal Register* 43 (7 September 1978), p. 39792.
111. Resources for the Future, "Environmental Public Opinion: Trends and Tradeoffs, 1969–1978," draft paper by Kathryn Utrup, Discussion Paper D–36, Washington, D.C.: 1978, p. 3.
112. *Ibid.*, p. 2.
113. Utrup finds that the public response is more strongly in support of environmental goals in the case of indirect tradeoffs—when economic, energy, and environmental goals are pitted against one another—than when direct tradeoffs are required—for example, when a choice must be made between jobs and environmental quality. *Ibid.*, pp. 2–3. See also, Robert Mitchell and Kathryn Utrup, "The Public's View," *EPA Journal* 5 (January 1979), pp. 26–28.

Transportation and Energy

8

INTRODUCTION

This chapter deals with interrelationships between transportation and energy. Transportation is a major consumer of energy (especially petroleum) and is essential to move energy in various forms from point of production to point of consumption. For its forecasts to the year 2000, the NTPSC investigated energy supply characteristics for transport and for other sectors of the U.S. economy, in the context of worldwide energy conditions. These energy conditions are volatile and uncertain, but estimates of energy prices are important for forecasts of transportation activity. This chapter describes the patterns of energy consumption, production, and movement expected by the year 2000. Significant findings are: the rate of growth in energy consumption by transportation is expected to decline; there will be great reliance on synthetic petroleum, thereby reducing dependence on oil imports; and coal consumption will rise, requiring additional transportation of coal.

The forecasts in this chapter used the National Energy Model described in Chapter 5. That model forecasts amounts and prices of energy consumed by end users, based on relative costs of production and movement. The model assumes that high enough energy prices would elicit sufficient energy supplies for future levels of consumption. It is further assumed that no major interruptions would occur in petroleum imports and that Federal regulation of energy prices would cease. Appendix III lists uncertainties that could alter the forecasts.

NATIONAL ENERGY CONSUMPTION AND PRODUCTION

ENERGY CONSUMPTION

The nation's energy is consumed by three end-use sectors: transportation, residential/commercial, and industrial. Table 13 presents forecasts of energy consumption by each of these sectors for each of the NTPSC's three growth scenarios. From the table it can be noted that growth rates among the sectors are expected to differ for each time period to the year 2000 and for each scenario. In the medium-growth scenario,[1] the total consumption of energy is expected to increase from almost 54 quads (quadrillion British thermal units) in 1975 to 89 quads in 2000, an average annual increase of 2.1 percent.[2]

For the transportation sector, average annual growth of 1.1 percent is anticipated to the year 2000, well below the average annual increase of 2.7 percent between 1947 and 1975.[3] The decline is largely attributable to improved efficiencies in automobiles and aircraft. Industrial consumption is expected to show the greatest rate of growth, an average of 3.5 percent annually over the course of the forecast period. This rate is based upon expected rapid growth in energy-intensive industries (particularly chemicals and primary metals), increased use of coal with low end-use efficiencies, and a rapid increase in the value added in industrial products.

The residential/commercial sector forecast shows the slowest annual average growth, 0.7 percent between 1975 and 2000, a sharp decline from that sector's historical average of 3.3 percent.[4] This slowdown is based on expectations of decreased population growth, saturation of the markets for appliances and air conditioning, improved efficiencies in buildings, appliances, and furnaces, and increased electricity use, which has a high end-use efficiency.

During the forecast period, transportation is envisioned to drop from 33 percent to 26 percent of energy consumption, while by the year 2000 the industrial sector may consume 54 percent of the nation's distributed energy compared with 39 percent in 1975.

NTPSC forecasts call for greater use of coal in the industrial sector of the economy and for electrical generation. Coal is to displace oil and natural gas consumed by industrial end-use and the intermediate stage of electrical generation. (It is assumed that many industrial and electrical generation processes presently using oil or gas can employ coal if it is economical.) Due to the availability of large, relatively inexpensive coal reserves, coal production can increase without a significant increase in the price per Btu. This will tend to reduce the demand for oil, because the more expensive oil will not be used for processes that can accommodate either oil or coal.

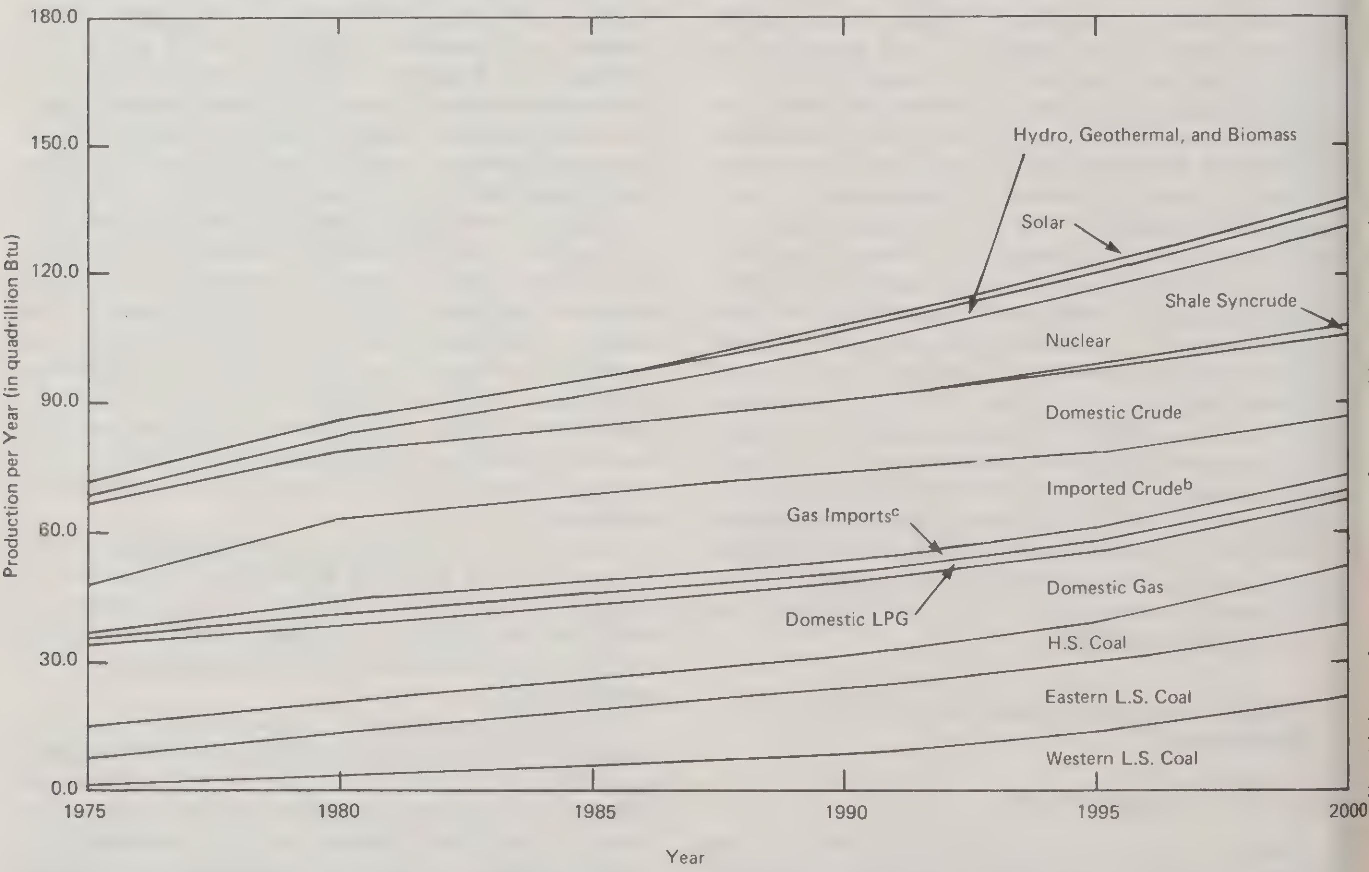
The amount of nuclear energy used for electrical power generation also is forecast to rise between 1975 and 2000 because of favorable economics, although environmental and safety factors may delay and reduce the projected growth. In 1975, nuclear fuel accounted for under 2 quads of the resources used for electric power generation; by 2000, nuclear's contribution is forecast to increase to over 23 quads. Between 1975 and 2000, the total energy used for electrical generation is expected to increase by almost 32 quads, to 50.6 quads in 2000. During the period, the amount of coal and nuclear power used by utilities is forecast to increase by 34.7 quads, while oil's contribution drops by over 1 quad to 1.6 quads in 2000. Abundant, relatively inexpensive supplies of coal and nuclear power are expected to support all of the growth in power generation.

ENERGY PRODUCTION

The major energy products which supply the needs of the U.S. are depicted in Figure 13, which traces their projected outputs to the year 2000.

The production of energy in the U.S., plus energy products that are imported, equaled about 71.6 quads in 1975. The figure is expected to rise to over 138 quads in 2000 under the medium-growth scenario. These figures, it should be noted, differ from those given in Table 13, because they are for "primary energy production," defined as the quantity of energy required during a given year to supply domestic energy consumption plus exports of energy products. Table 13, on the other hand, presented data on end-use consumption of energy by sector; these figures are smaller because energy commodities may pass through several production stages before they are finally consumed as end products.

FIGURE 13. Forecast primary energy production[a] for the U.S., 1975 to 2000, medium-growth scenario.



SOURCE: NTPSC forecast. See Appendix Table 21.

[a] Includes imports.

[b] Includes petroleum products and small quantities of imported methanol.

[c] Includes imported LPG.

TABLE 13. Forecast distributed energy product consumption by end-use sector,[a] 1975, 1985 and 2000, by scenario (quadrillion Btu per year)

			Low-Growth Scenario				Medium-Growth Scenario				High-Growth Scenario			
	1975		1985		2000		1985		2000		1985		2000	
Sector	Quads	Share	Quads	Share	Quads	Share	Quads	Share	Quads	Share	Quads	Share	Quads	Share
Transportation	17.35	33%	18.72	31%	17.34	28%	20.68	30%	22.76	26%	21.76	25%	25.75	25%
Industrial	20.72	39%	26.88	44%	29.81	48%	31.51	46%	48.50	54%	33.38	47%	57.88	57%
Residential/ Commercial	15.19	28%	15.20	25%	14.42	23%	16.05	23%	17.93	20%	16.20	23%	19.42	18%
Total	53.26	100%	60.80	100%	61.06	100%	68.24	100%	89.19	100%	71.28	100%	105.05	100%

SOURCE: NTPSC forecasts.

[a] Coal exports and lubricants, asphalts, and the like are excluded.

The near doubling of energy production forecast by the NTPSC translates into an average annual growth rate of 2.7 percent. This rate is markedly slower than the historic rate of 3.2 percent between 1947 and 1973.[5] That energy growth rate is also less than the expected growth in real Gross National Product (GNP) to the year 2000, pointing to a decline in energy input per unit of GNP as shown in Table 14.

The projected slower growth in U.S. energy production masks substantial shifts in the makeup of total energy supply. As shown in Figure 14, the share of the U.S. energy market accounted for by oil and natural gas is expected to shrink, while coal and nuclear power grow. Primary domestic production of oil is forecast to remain constant and natural gas is forecast to decline between 1975 and 2000. Imports of oil and natural gas are projected to grow at an annual rate of 1.4 percent, dropping their share of energy production from 18 percent in 1975 to 13 percent in 2000. In contrast, U.S. coal production is expected to increase from about 14.6 quads in 1975 to 53 quads in 2000, representing an annual average rate of growth of 5.3 percent. Nuclear fuel production is expected to increase by over 10 times during the forecast period.

A major projected development is the establishment of a synthetic fuel industry to transform coal into synthetic oil and gas. During the last decade of this century tremendous growth in synthetic fuel production is expected. In the year 2000, over 11 quads of synthetic oil and gas are projected to be produced, representing 18 percent of the total domestic supplies of these fuels. Of this synthetic production, 74 percent is expected to be coal-based. With the development of a large synthetic fuel industry, the availability of petroleum and gaseous fuels in the economy is not anticipated to shrink to the extent indicated by their diminished share of primary energy production.

TABLE 14. Forecast primary energy production and GNP, 1975 to 2000, medium-growth scenario

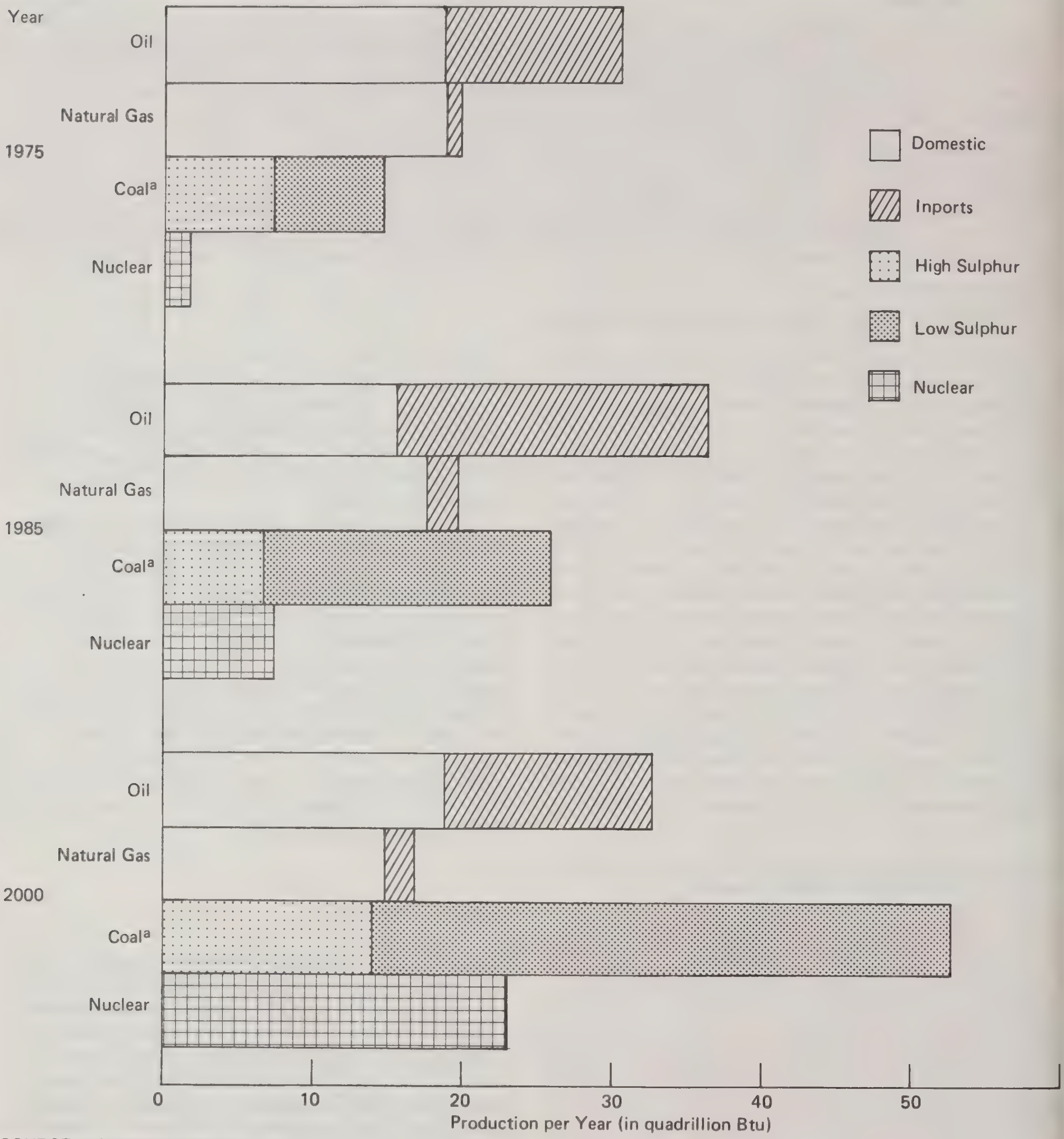
Years	GNP (Billion 1975 $)	Energy Production (Quadrillion Btu Per Year)	Btu/GNP
1975	1,529	71.57	46,808
1985	2,055	96.44	46,929
2000	3,201	138.33	43,215
Average Annual Growth Rate			
1975 to 1985	3.0%	3.0%	0.0%
1985 to 2000	3.0%	2.4%	–0.5%
1975 to 2000	3.0%	2.7%	–0.3%

SOURCE: NTPSC forecasts.

ENERGY PRICES

Forecasts of prices charged for energy resources (in 1975 dollars) are provided in Table 15. Consonant with the model rationale that the least-cost source of supply is preferred, sharper increases are forecast in crude oil and natural gas prices than for coal and uranium, making the latter more attractive over the coming decades. These price forecasts are based on the assumptions that production costs in domestic oil and gas fields will increase with continued extraction, that the Organization of Petroleum Exporting Countries (OPEC) will be able to raise real prices through the remainder of the century, but that large amounts of coal and uranium can be mined with only minimal real price increases.

FIGURE 14. Forecast production of leading primary energy products, 1975 to 2000, medium-growth scenario.



SOURCE: Appendix Table 22.

[a] Coal includes export metallurgical coal.

TABLE 15. Forecast prices[a] of leading primary energy resources, 1975 to 2000, medium-growth scenario, (mid-1975 dollars per million Btu)

Resource	Price Per M. Btu 1975	Annual Average Change 1975–85	Price Per M. Btu 1985	Annual Average Change 1985–2000	Price Per M. Btu 2000	Annual Average Change 1975–2000
Domestic Crude Oil	2.07	3.2%	2.85	1.0%	3.29	1.9%
Imported Crude Oil	2.20	2.4%	2.78	1.4%	3.43	1.8%
Domestic Natural Gas	2.04	3.1%	2.78	0.6%	3.06	1.6%
High Sulphur Coal	0.50	3.4%	0.70	0.1%	0.70	1.4%
Low Sulphur Coal	0.63	3.0%	0.85	–1.0%	0.73	0.6%
Nuclear (Uranium)	0.44	0.9%	0.49	0.1%	0.50	0.4%

(Mid-1975 Dollars per Conventional Units)

Resource and Unit		1975	1985	2000
Domestic Crude Oil	Barrels	12.01	16.53	19.08
Imported Crude Oil	Barrels	12.75	16.12	19.90
Domestic Natural Gas	Thousand cubic feet	2.12	2.88	3.17
High Sulphur Coal	Short ton	11.71	16.97	16.79
Low Sulphur Coal	Short ton	13.46	17.65	13.77
Uranium[b]	lb. U_{238}	21.55	23.45	23.99

SOURCE: NTPSC forecasts.

[a] Wellhead and minemouth prices, assuming no energy price regulation.

[b] Based on 145 million pounds / 33% thermal plant efficiency equals 47.9 million lb.

Because of the importance of petroleum fuels for the transportation sector, price trends in petroleum are of special significance. The real prices of crude oil and petroleum products are forecast to increase faster than the rate of inflation, amounting to a rise in constant dollars of 59 percent for domestic crude oil between 1975 and 2000, or an average of 1.9 percent annually. Nevertheless, the domestic production of crude oil is expected to continue decreasing until after 1985, returning to approximately the 1975 production level in 2000.

The forecast prices of energy for end-use in the transportation sector are presented in Table 16. These prices for gasoline, diesel fuel, electricity, and the like are given in terms of Btu equivalents for comparison.

NATIONAL PETROLEUM CONSUMPTION AND PRODUCTION

PETROLEUM CONSUMPTION

Petroleum fuels are of utmost importance for the transportation technology of 1979. Four key trends in total petroleum consumption by the U.S. to the year 2000 emerge from the NTPSC's forecasts:

1. The rate of growth in consumption by all end-use sectors of distributed petroleum products will slow to a lower rate than the increase in total end-use consumption of energy;
2. The rate of growth in consumption of petroleum-based fuels by the transport sector will slow markedly, shrinking transportation's share of distributed petroleum-product consumption;
3. Petroleum-based fuels will be employed more for industrial feedstocks, increasing the industrial sector's share of distributed petroleum-product

TABLE 16. Forecast energy prices (less Federal and state excise taxes) for transportation, 1975, 1985 and 2000, by scenario (1975 $ per million Btu equivalent)

		Low Growth		Medium Growth		High Growth	
Transportation	1975	1985	2000	1985	2000	1985	2000
Gasoline	3.95	4.11	4.61	4.48	5.04	4.78	5.19
Diesel Fuel	3.38	3.67	4.33	4.03	4.75	4.28	4.86
Electricity	N/A	N/A	8.43	N/A	8.43	N/A	8.43
Methanol	N/A	4.68	5.13	5.00	5.49	5.28	5.60
Jet Fuel	2.62	2.89	3.56	3.25	3.97	3.97	4.01
Marine Bunker Fuel	2.48	2.73	3.27	3.06	3.58	3.30	3.68

SOURCE: NTPSC estimates based on use of the SRI, Inc. National Energy Model consumption and skewing petroleum-product consumption toward regions that have industries based on petroleum feedstocks; and

4. Use of petroleum-based fuels for electricity generation will decline, making more petroleum available for end-use consumption.

The average annual increase in petroleum consumption is expected to be 1.6 percent to the year 2000, well below the 3.9 percent rate of 1947 to 1975.[6] Transport's annual rate of increase in petroleum consumption will be slightly under 1 percent.

The residential/commercial sector is expected to decrease its use of petroleum products, partly because that sector will consume more electricity. The industrial sector, though, may consume 151 percent more petroleum products in the year 2000 than in 1975. The annual average increase in petroleum product use by the industrial sector is projected at 3.7 percent, above its historical annual average growth of 3.3 percent.[7] The industrial sector will be using more petroleum-based feedstocks as input to industrial processes (such as petroleum in the manufacture of plastics). The use of petroleum feedstocks, which have no ready substitutes, is to grow 4.7 percent annually, while the direct industrial use of distillate and residual fuels will increase 2.2 percent annually.

These several changes in growth rates are expected to reduce the share of distributed petroleum products consumed by transportation. In 1975, transportation consumed 70 percent of distributed petroleum products. This will drop to 61 percent by 2000. While the share consumed by the residential/commercial sector is also forecast to drop over the same period, from 13 percent in 1975 to 8 percent, the industrial sector is to gain in share from 17 percent to 31 percent in 2000.

PETROLEUM PRODUCTION

Although overall U.S. petroleum production is expected to be relatively stable, considerable change is forecast in production locations. NTPSC projections indicate an extreme decline in production in the presently paramount Gulf Coast and West Texas regions. Production from these two regions is forecast to be 8.19 quads lower in the year 2000 than in 1975, in spite of an 82 percent increase in the average wellhead price for these regions' crude. During the forecast period, the other U.S. production areas (with the exception of Alaska) will also show aggregate production declines. Production is to begin in the Atlantic offshore region, but will remain below 0.2 quads per year throughout the century. Annual production in the Pacific region is forecast to increase by approximately 1 quad between 1975 and 2000, but these gains will not offset sharp declines (a net decrease from 1975 to 2000 totaling 2.9 quads) in the midcontinent, Rocky Mountain, and Appalachian regions.[8]

Declining U.S. production in most states is to be partly countered by large gains in production of Alaskan oil. In 1975, Alaskan production was under 0.5 quads. This is expected to rise to over 10.5 quads per year by 2000.

Annual imports of crude oil are to increase sharply from their 1975 level of 11.73 quads and reach 20.42 quads in 1990. (Throughout the decade of the 1980s, crude imports will exceed domestic crude production.) By 2000, imports will drop off to 14.10 quads. In real terms, the price of imported crude is forecast to rise as shown in Table 15, averaging 1.8 percent annually over the entire forecast period.

This assumption of slowly rising real prices for imported crude, with essentially unlimited quantities available for import during any year and throughout the forecast period, has major effects.[9] Through 1990, greater volumes of imports will serve as a ceiling for the market price of crude oil, checking the development of more expensive sources of domestic crude. In spite of the forecast of no gains in domestic production, the total amount of oil entering U.S. refineries from domestic production plus imports is to climb 5 quads between 1975 and 1980 and continue up until 1995, when these two sources will supply 37.2 quads of energy to refineries (almost 7 quads more than in 1975).[10]

ALTERNATE FUELS

In the final decade of this century, a rival for the markets presently belonging to domestic and imported oil is forecast: the production of synthetic oil from coal and oil shale. Shale can be transformed into crude oil that is similar to naturally produced crudes. Both low and high-sulphur coal can be transformed into a variety of products. Of special significance to transportation is the production of synthetic crude oil, which is suitable as an input for oil refineries, and methanol, a type of alcohol that may be used as a transportation and utility fuel. Research and development of processes to accomplish these transformations are now going on, and within the logic of the model applied by the NTPSC these will become commercially available in the 1990s. Due to the relatively low costs projected for material inputs and capital and operating expenses, significant production of synthetic crude oil is foreseen. In 2000, 6.2 quads (equivalent to 2.9 million barrels per day) of crude oil and residual fuel from coal and 2.2 quads (equivalent to 1.1 million barrels per day) of shale syncrude are to be produced. These 8.4 quads will represent 20 percent of the crude oil available to refineries from all sources—domestic oil production, imports, and synthetics—and the prices at which large supplies of syncrudes can be produced will act as a ceiling on the acceptable price of domestic crude production and imports.[11] There are, however, uncertainties in the development of alternative energy sources, as described in Appendix III.

Transportation's dependence on liquid fuels limits the possibility for fuel switching to alternate forms at the end-use level. In this respect, transportation is more vulnerable to petroleum disruptions than other sectors. For this reason, the manufacture of synthetic liquids is critical to transportation. Similarly, synthetic fuels and other alternative energy sources can be used by other end-use sectors to free scarce petroleum for transportation.

A host of other products can be created from coal. Chief among these are substitute natural gas (SNG) of pipeline quality and low-Btu gas that can be manufactured locally for use by industry. Coal also can be transformed into residual fuel oil, hydrogen, solvent-refined coal, and additional energy products. Although none of these are directly consumed by transportation, their use by other sectors of the economy can reduce national dependence on petroleum, such as the burning of SNG in lieu of heating oil. By 2000, the NTPSC forecasts production of 1.73 quads of SNG, representing over 7 percent of the nation's total supply of gas.

The development of synthetic fuels has major implications for the transportation sector. Moving synthetic fuels instead of coal will necessitate different transportation systems.[12] The NTPSC forecasts a huge increase in coal production, but much of it will be moved as oil or gas, from synthetic plants located near the mine-mouth, to oil refineries or to centers for gas distribution. The projected uses of coal to the year 2000, and Btus consumed, are shown in Table 17.

Biomass can be used to produce synthetic gas and ethanol. This production will occur at local sites and require little long-distance transportation. Although during the forecast period only limited production from biomass is projected, the long-term potential of this renewable resource may be great. Solar energy may become significant during the next century. The long-term significance of these energy sources and others, such as nuclear fusion or geothermal energy, should not be minimized, especially as their transport requirements differ radically from those of the principal current and near-term energy commodities.

TRANSPORTATION AND ENERGY CONSUMPTION

TRANSPORTATION'S SHARE OF NATIONAL ENERGY CONSUMPTION

Because of differences in the concentration of energy-intensive industries, significant variations are forecast to occur in transportation's share of regional end-use consumption as shown in Table 18. In 1975, transportation's share was higher in regions where labor-intensive industries predominate and lower where energy-intensive industries are concentrated. While the transportation sector's share is anticipated to decline in each demand region, it is not expected to fall uniformly. With a concentration of energy-intensive petrochemical industries, the East and West South Central regions' transport in

TABLE 17. Forecast uses of coal, 1975 to 2000, medium-growth scenario [a] (quadrillion Btu per year)

End-Use	Year					
	1975	1980	1985	1990	1995	2000
Electric Power Generation	8.141	12.317	14.883	17.153	18.718	19.558
Synthetic Liquids	—	—	.005	.013	2.477	9.671
Synthetic Gases	—	—	—	0.133	0.833	3.156
Miscellaneous Synthetics	—	—	—	0.024	0.153	.325
Feedstocks	0.190	0.345	0.563	1.048	1.601	2.189
Metallurgical Coal[b]	2.221	2.833	3.404	3.987	4.570	5.167
Coal Exports[b]	1.800	2.057	2.334	2.707	3.103	3.507
Industrial Fuel	2.250	3.338	4.695	6.187	7.722	9.294
Total	14.602	20.890	25.884	31.252	39.177	52.866

SOURCE: NTPSC forecasts.

[a] Projections by tonnage are displayed in Table 20.

[b] These end uses of coal are supplied entirely from Appalachian low-sulphur, high-Btu coal.

TABLE 18. Transportation's share of regional end-use consumption of energy, 1975 to 2000, medium-growth scenario [a]

Region	Year		
	1975	1985	2000
New England	41%	41%	38%
Mid Atlantic	34%	34%	31%
South Atlantic	42%	39%	34%
East South Central	28%	24%	19%
East North Central	30%	28%	23%
West South Central	21%	18%	14%
West North Central	43%	42%	36%
Pacific	44%	42%	39%
Mountain	35%	34%	30%
National Average	34%	32%	27%

SOURCE: NTPSC forecasts.

[a] Coal exports, lubricants, asphalts, and similar products are omitted from these percentages.

2000 will have a low share of all the energy consumed in those areas—less than 20 percent of the total. At the end of the century, the projections show that the Pacific and New England regions will still use almost 40 percent of their total energy for transportation.

TRANSPORTATION'S CONSUMPTION OF PETROLEUM PRODUCTS

NTPSC forecasts of petroleum fuel consumption in the transportation sector highlight six trends:

1. Transportation will consume more fuel, but the rate of increase will be far below the historic trend, due largely to efficiency gains in autos and aircraft;
2. Per capita fuel use will stay nearly level. Growth in travel and freight movement will counter-balance efficiency gains;
3. Transportation will be dependent on petroleum-based fuels for over 97 percent of its energy needs through the remainder of the century;
4. Gasoline use in absolute terms will decline, due to more diesel-powered autos and local trucks, and improved efficiencies for gasoline-powered vehicles;
5. Consumption of diesel and jet fuel[13] will grow during the forecast period, but at rates below historic trends; and
6. Real prices of transportation fuels will increase, with the rise in diesel and jet prices exceeding that of gasoline.

Even with transportation's use of petroleum growing at under 1 percent annually, well below the 1947 to 1975 rate of 4.2 percent annually,[14] transportation is not expected to diminish its dependence on petroleum-based fuels. This is so even with some introduction of alcohol fuels and electric vehicles for urban use. In 2000, the forecast is for consumption of 0.5 quads of methanol and 0.08 quads of electricity; these two fuels will represent 2.5 percent of transportation fuel consumption in 2000. Unlike the rest of the economy, transportation will remain dependent on petroleum fuels (including oil from shale and synthetic petroleum from coal).

Yet even a rate of growth under 1 percent means that by 2000 annual fuel consumption by transportation will be 31 percent greater than in 1975. Fuel consumption per capita will remain constant over the forecast period, in spite of efficiency gains. More travel (discussed in Chapter 10), combined with a shift from autos to aircraft for intercity travel and a limited role for more energy-efficient forms of transit, make reduction of energy consumption in passenger transportation an elusive goal. On the freight side, small gains in vehicle efficiencies are expected, while traffic carried will rise.

Slower growth in transportation fuel consumption is due in large part to projected efficiency gains for autos and aircraft. The NTPSC incorporated the efficiency standards contained in the Energy Policy and Conservation Act (EPC Act), assuming that the fuel efficiency of new automobiles will increase throughout the forecast period. After 1980, diesel engines for autos and local trucks are to become increasingly available. (It is assumed that all intercity trucks throughout the forecast period are diesel-powered). Reduced highway fuel consumption in the forecasts is due not only to the impetus provided by the EPC Act standards, but also to higher costs of fuel and the concomitant penetration of diesel-powered vehicles into the passenger car and local truck fleets.

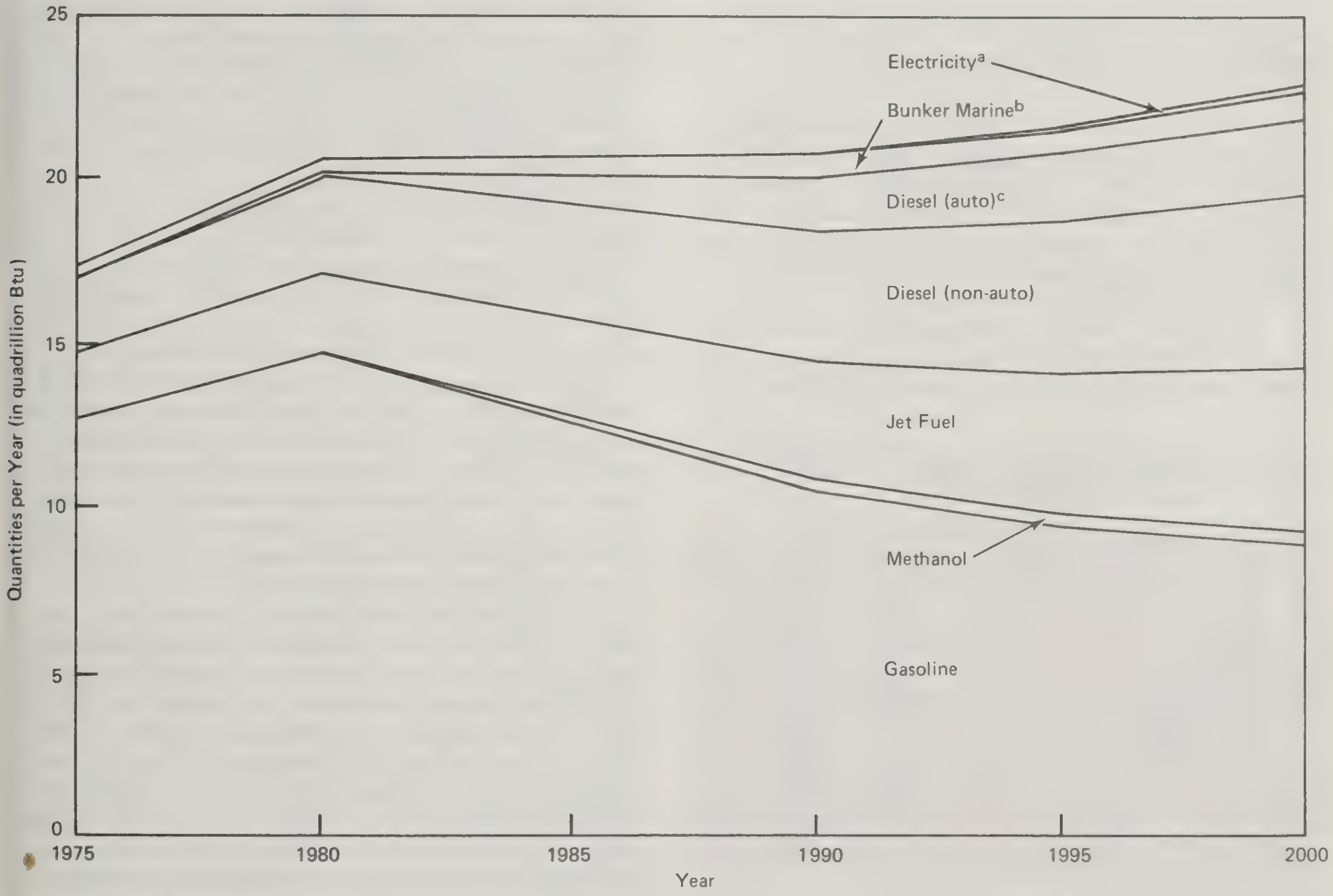
With increased fuel efficiency projected for gasoline-powered vehicles, and their declining share of the auto and local truck market, absolute gasoline consumption is forecast to drop by 2000. The average annual change during the forecast period is to be –1.5 percent, leading to over a 30 percent decrease in gasoline consumption between 1975 and 2000. This, of course, is a sharp reversal of the 1947 to 1975 historic trend, which saw gasoline consumption growing 4.1 percent annually.[15] In line with decreasing consumption, gasoline is expected to show the smallest price increase of the three major transportation fuels—gasoline, jet, and diesel. Lower consumption of gasoline could have implications for the refining industry, especially as the reduction is in part caused by a shift to diesel vehicles that require distillate fuels.

Using the NTPSC's examination of technological innovations for aircraft during the remainder of this century (see Chapter 6), a projection of decreasing energy consumption per passenger-mile by commercial aircraft was made. Fuel constitutes a significant portion of airline operating expenses, and motivation for reduced fuel consumption comes from recent fuel price increases and expectations of yet higher prices. Significant increases in the amount of air travel are forecast, as air is expected to capture a greater fraction of the growing intercity personal travel market. This growth will overshadow the efficiency gains built into the energy consumption projection, so that jet fuel use is forecast to grow at an annual rate of 3.7 percent (still well below its annual 5.2 percent historic growth between 1965 and 1975).[16] However, over the course of the 25-year period, consumption of jet fuel is forecast to increase by 148 percent.

Consumption of diesel fuel is expected to show the greatest average growth, 5 percent annually over the forecast period. The projected rise in diesel consumption is due to significant growth in diesel-powered autos and local trucks. By 2000, these vehicles will account for 30 percent of diesel fuel consumption. Intercity truck, rail, and marine use of diesel is also expected to grow rapidly, with these sectors showing an annual average growth in diesel consumption of 3.4 percent. However, the growth projected for diesel consumption is lower than the historical growth trend of 7.4 percent annually between 1947 and 1975.[17]

The transportation fuel mix will be altered significantly by 2000, as shown in Figure 15. In 1975, gasoline accounted for 73 percent of the fuel consumed for transportation, diesel for 13 percent and jet for 12 percent. By 2000, gasoline is projected to drop to 38 percent of the total, but diesel will rise to

FIGURE 15. Forecast consumption of energy products in the transportation sector, 1975 to 2000, medium-growth scenario.



SOURCE: Appendix Table 24.

[a] For electric cars.

[b] Excludes marine diesel.

[c] Intercity truck, bus, rail and marine diesel.

33 percent, and jet to 22 percent. Still, even in the year 2000, transportation will consume virtually no energy products other than those based on petroleum.

Because increased consumption of petroleum products by the regionally concentrated industrial sector will not take place uniformly throughout the U.S., transportation's share of delivered petroleum products will have significant regional variation, as shown in Table 19. In 1975 transportation's share of petroleum varied from about 54 percent of total petroleum consumption in New England, where oil is widely used in heating and industrial applications, to roughly 85 percent in the West North Central region, where natural gas and coal are used extensively for heat and power. The declining regional share of petroleum use by transportation is most pronounced where naphtha feedstocks constitute an important use of petroleum. In the East South Central and West South Central regions, less than half of the projected petroleum consumption in the year 2000 is to occur in transportation.

TRANSPORTATION OF FUELS

The NTPSC forecasts indicate one potential way in which the future energy needs of the nation can be met, and it requires a radically altered pattern of energy movement. More local coal consumption, coupled with a westward shift in the center of production, will require increased coal transport. Shifts are foreseen for other energy products, notably crude oil, refined petroleum products, and natural gas. New or enlarged transport systems for these commodities will be required, if a pattern of energy production and consumption similar to that forecast by the NTPSC is to be achieved. Maps that illustrate the projected changes in energy movements for coal, crude oil, and natural gas are contained in Appendix III.

TABLE 19. Transportation's share of regional distributed petroleum product consumption, 1975 to 2000, medium-growth scenario [a]

Region	1975	1985	2000
New England	53%	53%	61%
Mid Atlantic	57%	60%	63%
South Atlantic	76%	74%	71%
East South Central	66%	57%	46%
East North Central	74%	66%	61%
West South Central	56%	46%	37%
West North Central	84%	82%	78%
Pacific	82%	76%	74%
Mountain	82%	83%	85%
National Average	70%	66%	61%

SOURCE: NTPSC forecasts.

[a] Lubricants, asphalts, and similar products are omitted from these percentages.

ANTICIPATED CHANGES IN ENERGY COMMODITIES AND THEIR TRANSPORT

The production of syncrude from coal is projected to occur near the mines, with most of the production in the Northern Great Plains; oil from shale will come mainly from the Rocky Mountain region. Coupled with changes in the sites of domestic crude oil production and for imports, the origins of crude flows to refineries are forecast to change dramatically. Flows from Alaska will increase, with the forecast volumes exceeding the capacity of the Alaska pipeline; the Northern Great Plains will emerge as a major new source of supply, requiring complementary development of a transport system; production from the fields in Texas, Oklahoma, and Louisiana, presently the origin of the major pipelines, will shrink, a development exacerbated by parallel decreases in gas production from these regions; and imports, also handled through the existing pipeline systems, will increase slightly by the year 2000 in comparison to 1975, after peaking in 1990.

National growth in refining capacity over the forecast period is not expected to be great, but the shifting patterns of crude supply will make several regions more attractive for refinery development. West Coast and Chicago refining capacities are expected to grow substantially on the basis of accessibility to supplies of crude from Alaska and synthetic production. In the Southeast, refineries stocked by imports are expected to grow. During the forecast period, Gulf Coast refining is expected to decrease. Given the current dominance of the Gulf area, these shifts would transform the prevailing north and east pattern of flow into a more nationwide network with several major centers.

The aggregate consumption of natural gas is expected to decline over the forecast period, with major production shifts occurring. Supplies from the Gulf Coast and Southwest are expected to fall sharply and largely be consumed locally by 2000. These losses will be partly recouped by extensive development of Alaskan natural gas, and by lesser developments in several other regions: Atlantic offshore (for natural gas); Appalachia (for natural and synthetic gas); Philadelphia and the Southeast (liquid natural gas imports); Rocky Mountain region (for natural and synthetic gas); and the Interior and Great Plains regions (for synthetic gas).

Coal as a Commodity to be Moved

The movement of coal is of great significance to the transportation sector, because:

1. Future increases in demand for coal transportation will be of such magnitude that they will have significant impacts on transport systems, the economy, and the environment;
2. Increases in coal tonnages will require massive capital expenditures for transportation;
3. Increases in demand for coal may spawn the growth of a relatively new transport mode, the coal slurry pipeline;
4. Development of coal slurry pipelines may in turn contribute to modifications in present railroad regulation; and
5. Transportation is a major determinant of the rate of growth of coal use, for transport costs often comprise as much as 50% of the delivered price of coal.[18]

THE MARKET FOR COAL

Factors that affect the market for coal include: the price of coal (and coal-derived products) as contrasted with other competing fuels. Also, non-economic factors the foremost being regulatory requirements which govern the extraction, transport conversion, and consumption of coal, heavily influence the coal market.[19] Regulation indirectly affects capital formation by introducing costs, uncertainties, and delays.

Regulatory matters affecting the coal market include:

1. Federal and state land reclamation requirements;
2. Federal leasing requirements;
3. Mine worker health and safety requirements;
4. Taxation policies administered by Federal, state, local, and Indian governments, including severance, production and ad valorem, environmental taxes, and prossessory interest taxes; and
5. Federal and state environmental standards affecting production and utilization which are aimed at curbing adverse air and water pollution. Key among them are the EPA's New Source Performance Standards for coal-fired utility boilers and non-degradation and non-attainment requirements for site location in production and consumption areas, respectively.

Other factors affecting the coal market include:

1. Ownership and divestiture concerns impacting coal ventures (including foreign ownership);
2. Socio-economic impacts and disruptions that may occur in mining locales and end-use areas;
3. Labor and industrial relations in mining;
4. Coal conversion requirements of Federal energy policy;
5. Export potential of U.S. steam and metallurgical coal in the world market (involving U.S. export-import policies);
6. Use of local lignite and peat deposits to meet localized energy demand; and
7. Capital availability.

FACTORS AFFECTING TRANSPORT'S ABILITY TO MOVE COAL

Of concern is whether the U.S. transport system will be capable of moving the projected amounts of coal between various origins and destinations at a level of service acceptable to different coal users. Can the system provide the necessary physical capacity to handle coal traffic at reasonable rates and compensate for the social and environmental costs of hauling coal?

An answer requires a look at the physical system and attention to the following issues:

1. Is there sufficient infrastructure, including adequate rail trackage, uncongested locks on the waterways, properly constructed and maintained highways, and efficient loading and unloading (including transhipment) facilities?
2. Is there sufficient hauling equipment, including rail hopper cars, locomotives, barges, towboats, lake carriers, and trucks?
3. Do present operating practices permit efficient use of infrastructure and equipment?

In assessing the capability of the national system to respond effectively, issues which have already arisen include the following:

1. Will there be government funding for the modes which haul coal? Will Conrail funding and other Federal rail financing programs be continued? Will waterway investment continue to be funded mainly from the Treasury? How will states and localities pay for the maintenance of roads that carry substantial coal traffic?
2. Does economic regulation of the railroads hinder carriers' abilities to raise capital from private sources by limiting rate flexibility? Are recent ICC decisions and proposed changes in economic regulatory policy (including recent rate increases on major coal lines and changed accounting procedures on which those rates are based, the permitting of contract rates, and proposed zones of freedom for rate changes) sufficient to generate capital investment while protecting shippers against monopolistic pricing practices?[20]

3. What obstacles discourage the development of alternative transport modes such as coal slurry pipelines?
4. Are the social and environmental costs associated with developing and using additional transport capacity so great that more innovative approaches to providing transport service must be found?

With the above factors in mind, the next section discusses the NTPSC's forecast of coal movements.

FORECAST OF COAL MOVEMENTS

According to NTPSC projections, total coal production in the U.S. will rise from 660 million tons in 1975 to 1.2 billion tons in 1985 and 2.6 billion tons in the year 2000, if the social and economic conditions established in the medium-growth scenario occur. Through 1985, the Appalachian region is expected to maintain its substantial share of total production with 60 percent, while the Great Plains region is anticipated to experience rapid production increases. By the year 2000, a significant change is expected to occur in that Great Plains production will surpass that of Appalachia, resulting in a 43 percent share for the Great Plains and a 37 percent share for Appalachia (see Table 20).

In order to assess transport needs, the NTPSC's coal production forecasts were distributed between coal which must be moved beyond the local area (defined as a Bureau of Economic Analysis zone)[21] and coal which is consumed locally. The former category is referred to as "transported" tonnage and excludes short-distance hauls mainly by truck (but also by rail and waterway). Transported coal is expected to increase from 400 million tons in 1975 to 830 million in 1985 and 1.4 billion tons in the year 2000.

The volume of transported coal from Appalachia is anticipated to almost double between 1975 and 1985, rising from 228 to 429 million tons. Transported coal from the Great Plains is forecast to almost quadruple, from 48 to 184 million tons during the same period. From 1985 to 2000, coal transported from Appalachia is projected to increase by less than 60 million tons, while Great Plains coal production grows to over 500 million tons. Transported coal from the Interior region,[22] which is expected to increase by only 35 million tons from 1975 to 1985, will increase by more than 120 million tons to a total of 262 million from 1985 to 2000.

The demand for coal output has been disaggregated on the basis of consumption regions which correspond to the nine U.S. Census regions (see Figure 16). The major demand region for transported coal is the East North Central region, including Wisconsin, Illinois, Michigan, Indiana, and Ohio, with an expected 28 percent share of national demand in 1985. The next highest demand region (with an 18 percent share in 1985) is the South Atlantic region, stretching from Delaware to Florida along the Atlantic Coast.

Some of the fastest growth will be in the West South Central region encompassing Texas, Louisiana, Oklahoma, and Arkansas. From a base tonnage of 9 million annually in 1975, demand is expected to grow to 97 million tons in 1985 and reach 257 million tons in the year 2000, becoming the second highest demand region in the last forecast year.

Prior to estimating a modal split for transported coal tonnage, the forecasts were converted to traffic flows between region pairs. This step illustrates the relationship between the forecast trends and the transport network. In 1975, the largest interregional flow was 100 million tons between the Interior production region and the East North Central region. By 1985, the flow from Appalachia to the South Atlantic region is expected to reach 147 million tons. By 2000, the largest single flow is expected to be

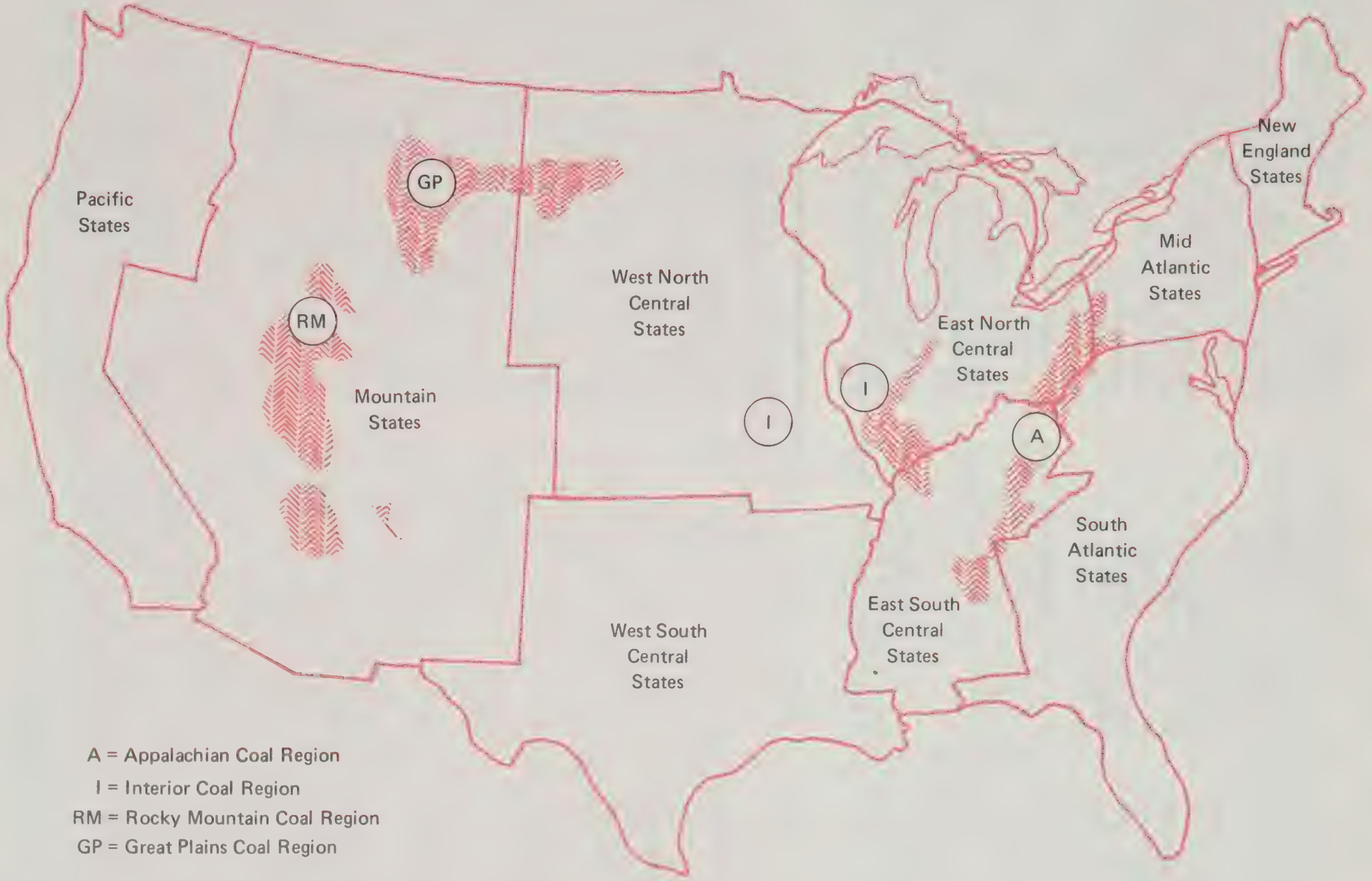
TABLE 20. Coal production and movement projections, 1975 to 2000, medium-growth scenario (millions of short tons)

Forecast Type	Year	Regions				
		Appalachia	Interior	Great Plains	Rocky Mountain	Total
Total Production	1975	447	134	60	19	660
	1985	719	166	228	84	1197
	2000	968	371	1122	160	2621
Transported Production[a] (Only inter-BEA flows)	1975	228	106	48	18	400
	1985	429	140	184	77	830
	2000	486	262	504	147	1399

SOURCE: NTPSC forecasts, 1979.

[a] Does not include local, intra-BEA movements, nor transport requirements due to the movement of solid waste created by the burning of coal in coal-fired power plants.

FIGURE 16. **Coal supply and end-use demand regions.**


Pacific States
Mountain States
West North Central States
West South Central States
East North Central States
East South Central States
South Atlantic States
Mid Atlantic States
New England States
GP
RM
I
I
A
A = Appalachian Coal Region
I = Interior Coal Region
RM = Rocky Mountain Coal Region
GP = Great Plains Coal Region

from the Great Plains to the West South Central region with 211 million tons.

Significant growth in coal flows should occur along the following corridors (see Table 21).

Appalachia – Middle Atlantic;
Appalachia – South Atlantic;
Appalachia – East North Central;
Interior – East North Central;
Great Plains – East North Central;
Great Plains – West North Central; and
Great Plains – West South Central.

In only one instance is there expected to be a major shift in the traditional relationship between a source and a demand region. By the year 2000, the East North Central region is expected to shift from Appalachian to Great Plains and Interior sources to meet its coal needs.

Based on the flow of coal between BEA pairs, the most appropriate transport mode was selected and tonnage distributed by the NTPSC between either railroads or waterways. In the case of energy commodities, the model used would select only the mode at the point of origin, so adjustments were made to account for transhipments of coal from rail to barge.

The resultant forecast for coal is presented in Table 22. By including only inter-BEA flows, the coal volumes in the base year vary from reported statistics for each mode. In the case of railroads, in 1975, 418 million tons of coal were reportedly carried as opposed to the NTPSC estimate of 351 million tons.[23] The difference could be accounted for by local movements within BEA zones.

Comparisons of the NTPSC rail forecasts with projections used in other studies (Table 23) suggest the NTPSC estimates to be reasonable, versus the extremes represented by the Manalytics high forecast and DOT's low forecast.

In the case of waterways, the NTPSC's estimates are significantly lower than those of other studies. Waterway statistics show 153 million tons of coal carried in 1975, excluding exported coal across the

TABLE 21. Forecast inter-regional coal flows,[a] 1975 to 2000, medium-growth scenario (millions of short tons)

		Production Regions				
Demand Regions	Year	Appalachia	Interior	Great Plains	Rocky Mountain	Total
New England	1975	2.2				2.2
	1985	13.1				13.1
	2000	16.0		0.1		16.1
Middle Atlantic	1975	42.6				42.6
	1985	103.7				103.7
	2000	146.8		0.7		147.5
South Atlantic	1975	90.9				90.9
	1985	146.9				146.9
	2000	202.8	0.1	0.3		203.2
East North Central	1975	31.0	100.4			131.4
	1985	116.5	102.4	16.1		235.0
	2000	78.0	163.5	133.7		375.2
East South Central	1975	60.8				60.8
	1985	48.4	26.0	0.8		75.2
	2000	42.4	65.4	16.4		124.2
West North Central	1975			48.3		48.3
	1985		1.2	91.8		93.0
	2000		3.0	136.6		139.6
West South Central	1975		5.2		4.0	9.2
	1985		10.7	73.3	13.1	97.1
	2000		30.0	211.2	16.0	257.2
Mountain	1975				13.3	13.3
	1985			1.8	36.7	38.5
	2000			3.9	73.4	77.3
Pacific	1975				1.1	1.1
	1985			0.5	27.3	27.8
	2000			1.1	57.3	58.4
Total	1975	227.5	105.6	48.2	18.4	399.8
	1985	428.6	140.3	184.3	77.1	830.3
	2000	486.0	262.0	504.0	146.7	1398.7

SOURCE: NTPSC forecasts, 1979.

[a] Only inter-BEA coal flows.

TABLE 22. Forecast modal distribution of coal flows, 1975 to 2000,[a] medium-growth scenario (millions of short tons)

Mode	Year 1975	Year 1985	Year 2000
Rail	351	753	1285
Waterway[b]	52	101	199

SOURCE: NTPSC forecasts, 1979.

[a] Excludes local movements and mine-mouth generation.

[b] Includes transhipped coal from rail to water.

Great Lakes to Canada.[24] The NTPSC shows 52 million tons. This discrepancy is due to two factors: first, intra-BEA movements are not included in the NTPSC estimates; and second, there is apparently much transhipment of coal which could not be isolated without a detailed evaluation of current coal flows.

Adequacy of Service and Railway Capacity

There have been statements about the capability of the rail system to handle future coal traffic, but surprisingly few studies have applied a detailed segment analysis of the system and future requirements, and even fewer studies look beyond 1985. Currently there are two government efforts to analyze coal movements: a joint DOT-DOE study which will review energy transport needs to the year 1999, and a joint Department of Agriculture-Environmental Protection Agency study on coal movements to 1985. Both are expected to apply a detailed segment analysis for the rail network, but neither as of mid-1979 had published any reports of this work.

TABLE 23. Comparison of coal movement forecasts by rail, 1985 and 2000 (millions of short tons)

Study and Year of Study	Year and Tonnages 1985	Year and Tonnages 2000
NTPSC, 1978 (medium-growth scenario)	753	1,285
Department of Transportation, 1978	675	—
Office of Technology Assessment, 1978	766	1,274
Manalytics, Inc., 1976	1,200–1,500	—
Barber Associates, Inc., 1977[a]	690–837	

SOURCE: NTPSC forecasts, 1979.

[a] The high figures represent implementation of the "National Energy Plan (1977)," and the lows represent the flow without the "Plan."

Of the prior studies, there are reports by Manalytics, Inc. and by Barber Associates (which used an extremely high tonnage-projection for 1985).[25] Also an unpublished, confidential study performed for a private party was reviewed by NTPSC staff in 1978. That study used flows similar to those of the NTPSC.

One significant conclusion which can be drawn from the NTPSC regional forecasts is that to judge energy transport needs on the basis of 1985 flows could result in shortsighted policies. The critical shift in coal movements after 1985 from eastern to western coal sources is expected to change the relative balance of flows over different segments of the coal rail network. Also, the increase in coal tonnages and the concentration of some flows could justify the use of alternative modes such as slurry pipelines.

To verify this conclusion, the NTPSC assigned each flow (projected rail tonnage) of more than 500,000 tons annually between BEA pairs to the rail segments that would most likely carry the tonnage. In general, current network conditions and shipper practices were used to select an appropriate routing, with the exception of new segments in the west which are presently being considered, such as a connection between the Chicago & North Western and the Union Pacific to handle Powder River Basin coal after 1985. Capacity constraints were not applied to the assignments, unless in extreme cases it was obvious that a parallel routing on an existing line was more logical than assuming extensive improvements to the primary line. The results are summarized in Table 24. A review of line capacity was undertaken, however, to ascertain the railroads' capability to handle the consigned traffic. Both the capacity of present lines and the potential for upgrading were assessed.

From the NTPSC's investigations, it is believed that by 1985 many segments of the nation's rail system may experience some degree of deficiency. The key corridors requiring investment will be those which connect the Great Plains coal region to the West North Central and West South Central Census Regions and the corridor which connects the Appalachian coal region, especially Kentucky and Tennessee, to the South Atlantic Census region. The elimination of these deficiencies is not expected to require a significant amount of new rail infrastructure by 1985, but rather indicates improvements should be made to existing lines in the form of signalization, shorter spacing between sidings, and upgraded maintenance.

By the year 2000, dramatic changes are forecast to occur (see Table 24). Of 21 railroads which are expected to haul more than 20 million tons each of coal annually, 8 will carry more than 100 million tons each. Based on the existing infrastructure and

TABLE 24. Forecast distribution of coal by rail, 1976 to 2000 (millions of short tons)[a]

Rail Carrier	1976[b]		1985[c]		2000[c]	
	Originating	Other	Originating	Other	Originating	Other
Atchison, Topeka & Santa Fe	1.7	3.3	8.0	22.0	44.5	57.5
Baltimore & Ohio	23.2	19.2	35.9	39.0	38.3	53.7
Burlington Northern	42.9	2.9	123.6	4.3	374.1	7.8
Chesapeake & Ohio	48.2	10.4	71.0	33.8	80.5	39.3
Chicago, Milw., St. Paul & Pac.	5.0	4.0	9.5	8.6	15.9	54.9
Chicago & North Western	3.4	12.3	7.1	23.6	62.3	46.1
Chicago Rock Island & Pac.	1.4	0.9	—	4.6	—	17.8
Clinchfield	7.5	5.9	4.3	17.3	6.2	23.9
Colorado Southern	—	3.8	—	26.6	—	93.8
Conrail	41.3	40.1	65.2	38.6	83.4	80.5
Denver & Rio Grande Western	12.3	2.0	47.2	—	81.7	—
Fort Worth & Denver	—	1.0	—	25.8	—	71.2
Illinois Central Gulf	21.2	2.6	31.7	4.1	64.7	14.0
Kansas City & Southern	0.1	0.5	—	—	—	12.8
Louisville & Nashville	56.7	2.7	68.1	4.0	98.1	7.5
Missouri-Kansas-Texas	0.9	—	—	5.9	1.3	18.3
Missouri Pacific	11.2	3.4	0.9	7.4	3.3	48.6
Norfolk & Western	67.0	8.4	100.9	5.1	115.4	13.5
Seaboard Coastline	—	16.4	0.6	30.2	1.1	44.6
Southern	26.5	8.8	23.1	23.1	38.9	28.7
Southern Pacific	—	0.5	—	14.3	—	30.4
St. Louis San Francisco	3.9	1.5	—	10.8	—	28.4
Union Pacific	14.1	3.2	18.6	22.0	54.0	95.5
Western Maryland	6.2	4.5	—	7.5	—	23.2
Total	394.7	158.3	615.7	378.6	1163.7	912.0

SOURCE: NTPSC estimates, 1979.

[a] Assignments generally made without regard for capacity constraints.

[b] Includes all tonnage carried, local and inter-BEA movements from National Coal Association, *Coal Traffic Annual*, 1977, pp. 3–5.

[c] Includes only tonnage carried between BEA regions and excludes local movements.

shipper practices, the concentration of coal production in the southern Powder River Basin in southeastern Montana and northern Wyoming will result in the growth of Burlington Northern (BN) coal traffic from 46 million tons in 1976 to over 380 million tons in the year 2000 moving towards Duluth, Minnesota, across North Dakota; towards St. Louis across Nebraska; and south towards Texas through Colorado.[26]

Other significant but less dramatic traffic increases are expected to occur on the Chicago & North Western, the Atchison, Topeka & Santa Fe, the Colorado Southern, the Missouri Pacific, the Fort Worth & Denver, the Denver & Rio Grande Western and the Union Pacific railroads in the West. In the East, Conrail will continue to be crucial to coal movements and there will be large increases on the Louisville & Nashville and the Illinois Central Gulf.

A review of individual line segments reveals the severe impact of coal traffic on line-haul capacity. The most extreme cases are on the BN lines. Across North Dakota (Bismark to Fargo) the BN line, currently single track with automatic block signals, will be expected to handle over 80 million tons of coal annually by 2000, or 27 trains of 100 cars each, daily, in each direction. Similarly, from Alliance to Grand Island, Nebraska, over 116 million tons of coal annually are projected. (That line currently is a single track with centralized traffic control.) To illustrate the effect on capacity, it has been estimated that a single-track system could handle from 20 to 50 million net tons of cargo annually, depending on the cargo mix and the proportion of traffic represented by unit train movements.[27]

For an illustration of coal movements by eastern and western rail as projected for 1985 and 2000, see the maps in Appendix III.

Other Railroad Capacity Issues

In the transportation of coal by rail, shippers and receivers generally stress hopper car availability over other service elements such as transit time. This has led to controversy over the ability of rail carriers to meet hopper car demand, especially in the case of small mines and small industrial coal consumers. The larger shippers have responded to service uncertainties by using privately owned hopper cars and by obtaining unit train service in which the cars, either privately or carrier-owned, are dedicated to shippers' routes.

Problems may remain with regard to small mine operators and coal users for whom unit train service or private cars are not feasible alternatives. Service to these shippers usually results in poorer utilization of hopper cars. For example, a car in unit train service may complete as many as 50 trips per year compared to a car in regular service which often completes only 20 trips.[28] The problem of the small shipper and receiver may grow as industrial coal conversion efforts are stepped up.

A forecast was made of hopper car and locomotive needs to 1985, taking into account the varying utilization characteristics of eastern and western utility coal and non-coking industrial and export coal. To carry projected new flows from 1977 to 1985, the carriers or the shippers will have to add 8,690 hopper cars and 290 locomotives annually, not including units required to replace the aging stock. Car production capacity to meet this demand was found to be adequate. A summary of the NTPSC and Association of American Railroads (AAR) coal car and locomotive forecasts for 1985 is presented in Table 25.

Waterway Capacity

The following discussion of waterway capacity to meet the demand of future coal traffic is divided between the inland and intracoastal system and the Great Lakes. According to the NTPSC forecast, by 1985, the Mississippi River south of St. Louis and the Ohio River System[29] will experience significant increases in coal tonnage with volumes more than doubling on most segments, compared with 1975. By the year 2000, with a dramatic shift to western coal, a large rise in the Interior region's coal production, and the stabilizing of Appalachian production, the trend on the Ohio River changes such that only from Louisville, Kentucky, westward are there significant increases in coal movement. The Mississippi, south of St. Louis, will continue to experience unprecedented traffic volumes with a tripling of 1985 coal flows, due to the transhipment of western coal from rail to barge near St. Louis, which is expected to rise from 14 million tons in 1985 to 53 million tons in 2000.

TABLE 25. Projected car and locomotive requirements for coal movements, 1977–1985.

	Replacement Cars		Additional Cars	
	NTPSC	AAR	NTPSC	AAR[c]
Hopper Cars[a]..........	4,700	4,100	8,690	5,600 to 9,300
Locomotives[b]..........	240	205	288	280 to 456

SOURCE: NTPSC forecasts, 1979, and the Association of American Railroads, "Background on Transportation: Coal and the Railroads, 1978" p. 8.

[a] 100-ton capacity cars

[b] 3000 hp

[c] Range represents "high" and "low" unit train scenarios.

The identification of constraining locks by three previous studies is shown in Figure 17 and Appendix Table 25. For the most part, the findings are similar. The timing of the deficiencies is presented in Appendix Table 26 for the constraining locks identified by the Mid-America Ports Study sponsored by the U.S. Maritime Administration.[30]

From the studies these conclusions can be drawn:

1. Due to the increase in all waterway traffic, bottlenecks will arise at locks along the inland waterways;
2. Coal movements along the Ohio River System and the Illinois River will be significantly affected by limited lock capacity;
3. Coal moving down the Mississippi to Gulf Coast ports east and west of New Orleans will be affected by limited capacity on the Gulf Intracoastal waterway; and
4. New coal traffic on the inland waterways, especially after 1985, will be concentrated on the lower Mississippi, originating near St. Louis, and will not be affected by constraining locks.

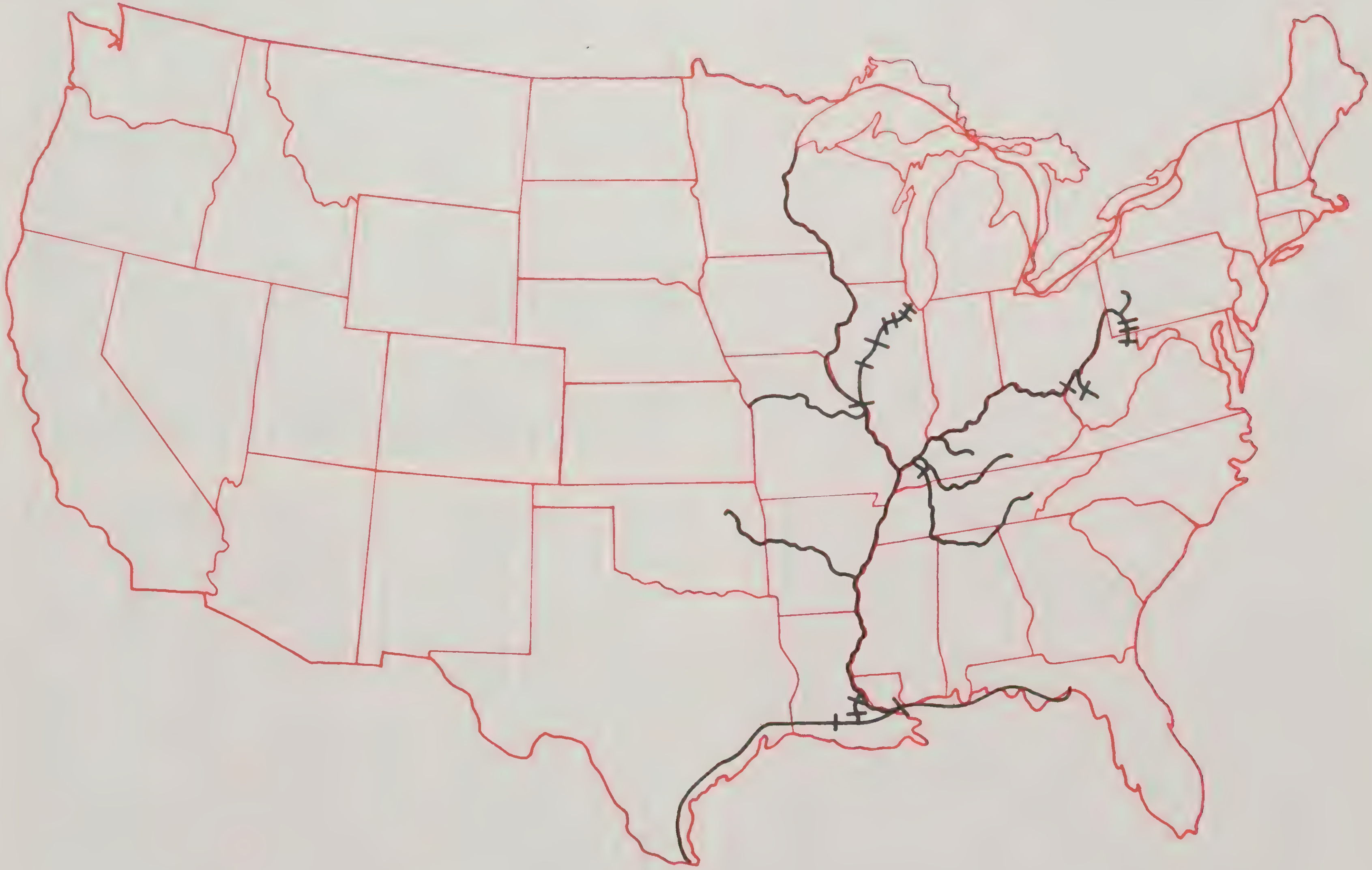
The increase in hopper barges required to meet additional coal demand was not regarded as a problem, considering current barge production capacity. No assesssment of towboat requirements, however, could be made.

Although no analysis has been made of the ability of parallel rail lines to handle diverted traffic if the locks are not improved, future waterway investment needs should be evaluated from a multimodal perspective.

In the case of the Great Lakes, the NTPSC forecasts a directional shift in coal movements (which has begun to occur). The transhipment of western coal from rail to lake carrier at Duluth, Minnesota on Lake Superior, to Detroit Edison power plants on the St. Clair River, is expected to expand to other lake facilities such that by the year 2000 over 25 million tons of western coal will be shipped from Duluth-Superior. In contrast, traditional coal sources on Lake Erie will increase shipments until 1985, after which time western coal will meet most additional demand.

The shift in the movement of coal from west to east on the lakes, as well as the projected increase in grain, iron ore, and limestone movements originating

FIGURE 17. **Constraining locks identified in previous studies.**



SOURCE: See Appendix Table 25.

on Lake Superior, has caused concern over the capacity of the Locks at Sault Ste. Marie, only one of which (the Poe Lock) can accommodate 1,000-foot lake carriers. The U.S. Army Corps of Engineers estimates that lock capacity will be reached in the 1990s.[31]

The Corps has also estimated that the Welland Locks will face severe capacity constraints in the mid-1980s as grain and Canadian ore traffic grow. At present, 7-1/2 million tons of coal pass through the series of eight locks from Lake Erie ports to Canadian consumers on Lake Ontario. Thus, there is little effect on domestic coal traffic but a considerable effect on the movement of coal to Canada.

One other capacity problem, mentioned in previous studies, is construction capacity for the required 1,000-foot vessels to move coal and other commodities on the Lakes; studies have differed in their assessment of vessel-building capacity and the Corps of Engineers finds that it is a short-term problem which could be easily resolved.[32]

Another capacity concern which relates to western coal traffic across Lake Superior is the limited 250-day navigation season on the lakes. This limitation leads to traffic peaking factors which are much higher than under full 12-month operating conditions. The Corps of Engineers has been investigating the technical and economic feasibility of extending that season. A current proposal is a request for authorization of an "operational plan" which will help maintain a 10-month navigation season on the upper four Lakes.[33] The request does not include funds to clear harbors which are limited by ice formations during the winter; thus, coal traffic from Duluth would not benefit, except when weather permits vessel loading at the harbor. The Corps estimates that a 12-month navigation season could postpone capacity constraints at the Sault Ste. Marie locks for as many as 20 years beyond the expected time (1990 to 1995) without the season extension.[34]

The Corps is conducting a feasibility study for a 12-month extension of the upper four lakes and an 11-month extension through the Welland Canal and the St. Lawrence Seaway.[35] As for the latter, the need for Canadian cooperation and the environmental issues which have been raised make the analysis and implementation of any season extension plan more complex than on the upper lakes. Pricing strategies offer another alternative that may be more cost-effective.

UNCERTAINTIES IN ENERGY TRANSPORT

To summarize, the following discussion of uncertainties in the movement of energy commodities, including coal, is presented. Near-term policy decisions in transport and other functional areas, by all levels of government, will greatly affect the resolution of these uncertainties.[36]

Disposition of Alaskan Oil and Natural Gas

Although the first important link with Alaskan resources, the Trans-Alaskan pipeline for crude, has been completed, other transport systems appear to be needed: a pipeline to deliver Alaskan natural gas to the lower states (planned, but not yet constructed); additional crude pipeline capacity both within Alaska and eventually to the lower states; and both tanker facilities and pipelines to handle Alaskan oil along the West Coast.

Hazardous Material Transport Regulations

Many energy commodities are considered hazardous materials and their transport is regulated by an array of Federal, state, and even local agencies. Hazardous materials transport is discussed in Chapter 7. Specific energy concerns are: tanker safety and design; nuclear shipment rates and safeguards, by rail and motor carrier; and movements of pressurized gases by pipeline, rail, and motor carrier.

Pipeline Divestiture

Petroleum pipelines owned by major oil companies connect producers, refiners, and marketers. This special status has been criticized as being potentially anti-competitive.[37] Divestiture, prohibiting oil company ownership of pipelines, has been proposed as one way to increase competition with the oil industry and to increase accessibility to pipelines by non-owner shippers.[38]

Deepwater Ports

Increasing petroleum imports and shipments from Alaska have created a demand for very large tankers to lower unit costs over necessarily long shipping distances. Because most U.S. ports are not deep enough for these tankers, their cargo must be offloaded into smaller vessels, significantly raising costs. Construction of offshore deepwater ports requires Federal review and approval.

Cargo Preference and Cabotage Laws

Cabotage laws require waterborne cargo moving between U.S. ports to be carried in domestic ships with domestic crews. Transport between Alaska, Hawaii, Puerto Rico, and the mainland is thus regulated. U.S. cargo preference laws require half of all government-originated cargo to be transported in U.S.-flag carriers. Consideration has been given to a requirement that a percentage of all imports of energy commodities also be carried in domestic vessels.

LNG and LPG Transport

Importation of liquefied petroleum gases (LPG) and liquefied natural gas (LNG) from Alaska and abroad is expected to increase, but may be hampered by delays in construction of special receiving facilities and uncertainties about safety requirements for tankers to carry the cooled, liquefied gases.

Northern Tier Refineries' Supply Problems

A shortage of crude in the northern tier states and upper midwest, caused primarily by curtailments of Canadian crude exports to the U.S. and a surplus of Alaskan crude on the West Coast, has led to a decision to build a Northern Tier pipeline. Permit delays have held up construction since 1975 and the affected refiners are searching for alternative short-term solutions, including tanker transport to Washington State and the Great Lakes, pipeline supplies from Canada and the Midwest, and even "unit" tanker trains.[39]

Transport of Oil from Strategic Petroleum Reserves (SPRs)

With SPRs established along the Gulf Coast and currently being filled, attention is being given to transportation problems associated with using reserves in an emergency. Waterborne transfers to refineries may be hampered by Jones Act restrictions that require use of U.S.-flag vessels. In addition, because emergency consumption of SPR crude could strain Gulf Coast refineries, connections to refineries in other sections of the country may be needed.[40]

Transport of Synthetic Fuels West of the Mississippi

If by the year 2000, syncrudes from Great Plains coal and Rocky Mountain shale, and synthetic gases, become a significant part of U.S. oil and gas production, their development will depend to a large extent on the construction of a transport network to get these synthetics into the national crude and gas systems. Present systems are oriented to the Gulf Coast.[41]

Energy Movement Vulnerability to Sabotage and Natural Disasters

Severe winters, earthquakes, and other natural disasters can seriously affect the transportation system's ability to supply energy commodities by rail, water, pipeline, and motor carrier. Sabotage of transport links is also a possible danger, and pipelines, because of the quantities and distances involved, are probably most vulnerable. There is a noticeable lack of security measures and procedures to minimize disruption from both natural disasters and sabotage.[42]

Concerns Affecting Coal Movement

COMMUNITY DISRUPTION BY LARGE-SCALE TRAIN MOVEMENTS

Several studies of this matter are underway in Colorado, Minnesota, and North Dakota.[43] The principal causes of difficulty are:

1. Delay and disruption of vehicle traffic at non-separated grade crossings. This causes restriction of local vehicle movements, including police and emergency vehicles; and
2. Noise and pollution resulting from 4 to 5 locomotives and 100 open-top cars (with engine noise at 90 to 100 decibels and cars at 75 to 85 decibels).

Secondary effects are property depreciation and interference with community development in the vicinity of the rail line.

Principal solutions envisioned or sought by most communities surveyed are separated grade crossings, and the construction of rail by-passes.

HIGHWAYS

Principal impacts on highways brought about by expanded coal movement are dust, noise, safety problems, and premature highway deterioration. These matters have been studied by the Appalachian Regional Commission, the Kentucky DOT, and the U.S. DOT.[44] Local roads and other highways not designed for heavy coal traffic create road safety problems in the form of deterioration of roads and hazardous driving and passing conditions. Funds appear inadequate to correct the problem.

RAILROADS

The capital required to meet coal-haul demands may strain the railroads' financing abilities.

Concentration of future coal shipments in certain corridors served by only one railroad could constitute a monopolistic situation in the event of railroad deregulation.

The potential abandonment of both branchlines and parallel main routes presents problems of timing. In the future they may be required or desired to handle excess loads on other lines and highways—in some cases perhaps not for 15 or more years. How can these resources be kept in reserve without placing unreasonable burdens on private firms? Is it desirable from the future viewpoints of economics and civil defense to permit concentrated movements of basic energy resources on a single transportation mode or corridor? Can branchlines in coal-reserve districts (principally in the East) be extended, upgraded, and maintained for less cost than building and maintaining highways?

Will development of coal slurry pipelines damage the economic viability of coal-hauling railroads? The issue raises questions concerning the unequal regulatory frameworks that govern rail and pipeline ratesetting. Should railroads be permitted or encouraged to enter into long-term contracts with coal shippers (as pipelines would do)?

COAL SLURRY PIPELINES

Should Federal power of eminent domain be extended to coal slurry pipelines? This question contains a host of issues, including:

1. Water availability for pipeline use;
2. Environmental impacts of pipelines, particularly at sources and destinations;
3. Traffic and revenue impacts on competing railroads;
4. Comparative costs of pipeline versus unit train service; and
5. Large coal slurry pipelines, being "one-stop" movers of coal, may pose potential distribution capability limitations.

WATERWAYS

What will be the impact of user charges on the waterway share of coal traffic? How much diversion to other modes might take place? What will be the impact on delivered price of coal and how sensitive to this price rise will coal use be?

Will the Great Lakes offer a more attractive route for West-to-East coal shipments and, if so, what will be the environmental impacts of greater utilization of this route?

NOTES AND REFERENCES

1. In this chapter, unless otherwise noted, all forecasts are based on the medium-growth scenario described in Chapter 5.
2. A quad is a measure of a fuel's heat content. It represents a quadrillion (1,000,000,000,000,000 or 10^{15}) Btus and is frequently referred to because it facilitates comparisons among fuels, although, for the same purpose, different energy forms have different levels of useful energy output. A Btu (British thermal unit) is the quantity of heat required to raise the temperature of one pound of water 1° F at or near 39.2° F. As an illustration, a barrel of crude oil contains approximately 5,800,000 Btus, and 172.4 million barrels constitute 1 quad.

   It should be noted that the use of energy of various types in electric generation complicates the discussion presented in this chapter because power plants often generate electricity with fuels that can be used directly as distributed energy products. However, electricity is the end-use product consumed, so the generation of electricity is an intermediate conversion stage rather than a process at the level of distributed energy products.
3. American Petroleum Institute, *Basic Petroleum Data Book*, Washington, D.C.: 1978, Section 1, table 11. (Hereafter cited as API, *Data Book*).
4. *Ibid.*
5. U.S. Department of Energy, Energy Information Administration, *Annual Report to Congress 1977: Statistics and Trends of Energy Supply, Demand, and Prices*, Washington, D.C.: Government Printing Office, 1978, pp. 3 and 9. (Hereafter cited as Department of Energy, *Statistics and Trends.*) This historic rate of growth refers to domestic use of primary energy. During the postwar period the fraction of production accounted for by exports steadily decreased, so including exports in a measure of the nation's historic demand for energy could be misleading. The exclusion of export coal from the forecasts would not alter the growth rate reported in the text.
6. *Ibid.*, p. 35. The petroleum consumption increase is for end-use demand in the residential/commercial, industrial, and transportation sectors, plus a sector termed other; use by electric utilities is excluded.
7. *Ibid.*
8. Many factors, including tax treatment, regulation, and the general investment climate play roles in exploration and production decisions. Also, uncertainties associated with resource estimation and production potential are great. Different geological outcomes would affect aggregate production, price, and the location of extractable resources. For example, current U. S. Geological Survey estimates for undiscovered oil and gas resources vary between 49 and 142 billion barrels for oil, and 312 to 768 trillion cubic feet for natural gas. For countries not as well explored as the U.S., estimates are even broader. For further discussion see: John J. Schanz, Jr., "Oil and Gas Resources-Welcome to Uncertainty," *Resources*, No. 58, March 1978.
9. The uncertainties in the international energy market make tenuous any assumptions about future supplies and price. A large number of studies of the international energy market are available and they differ on key points such as: the worldwide demand for energy (the U.S. purchases only a fraction of the internationally traded oil); the production and export potential of currently exporting countries (such as Saudi Arabia) and of pioneer exporting countries (such as Mexico and China); trends in international prices; and political developments that could affect the energy market.
10. See Appendix Table 23, "Production of Primary Energy Resources, Medium-Growth Scenario."
11. These forecasts are more bullish than most in their estimation of the growth of synthetics. Similarly, the projected price at which synthetics compete with conventional fuels is optimistically low. In light of recent (and forthcoming) increases in the price of imported oil, the role of domestic synthetic fuel production may not be underestimated. It is likely, however, that the price of synthetics will be higher than projected. This is due in part to additional costs imposed by the necessary consideration of environmental, safety, and occupational health concerns.
12. Synthetic low-Btu gas will involve little transport of coal. Also, because of the low energy content per cubic foot, it is uneconomical to ship this gas through pipelines. Although the NTPSC forecasts little low-Btu gas production, this technology offers the possibility of utilizing coal deposits that currently are not developed because of their low energy content, such as lignite. As many deposits are located close

to consumers, this would affect the long-distance movement of both coal and synthetics.

13. This forecast does not include the recent impact of deregulation which may increase, at least in the short term, jet fuel consumption.
14. Department of Energy, *Statistics and Trends,* p. 25. With the virtual disappearance of coal as a transportation fuel during the historic period, consumption of petroleum by the transport sector grew faster than total energy usage.
15. *Ibid.*, p. 33. The 1947 figure includes naptha-type jet fuel and special napthas.
16. *Ibid.* The historic period used for this calculation is 1965 to 1975. Before 1965, data for kerosene-type jet fuel were included with data for kerosene.
17. API, *Data Book,* section VII, tables 11 and 11a. This rate is based on sales of distillate fuel to railroads, for vessel bunkering, and all diesel type fuels, both for on highway and off highway use.
18. T. C. Campbell, M. J. Wang and F. Shahrokh, "The Influence of Coal Transport Costs on the Optimal Distribution of Coal and the Optimal Location of Electric Power Generating Plants," prepared for the U.S. Department of Transportation, 1979, p.1.
19. Tradeoffs among different regulations can have a significant effect on the choice of energy to be used in a demand region. For example, local use of lignite in Texas as a primary source for low-Btu gas, as well as on-site generation of electricity as compared to the use of long distance rail-hauled Western coal reflects rising rail coal rates, environmental regulation, and energy conversion regulation.
20. See recent Ex Parte 347: "Western Coal Rate Investigation and Proceedings" of the ICC.
21. BEA zones used by the NTPSC are those delineated in U.S. Water Resources Council, *1972 OBERS Projection,* Vol. 2, 1974.
22. The Interior region consists of Illinois, Indiana, western Kentucky, Missouri and Kansas.
23. National Coal Association, *Coal Traffic Annual–1977,* Washington, D.C.: 1978, p. 12.
24. *Ibid.*, p. 37.
25. Manalytics, Inc., *Coal Transportation Capability of the Existing Rail and Barge Network, 1985 and Beyond,* Palo Alto, California: Electric Power Research Inst., September, 1976, p. 72; and Richard J. Barber Associates, Inc., *The Railroads, Coal and the National Energy Plan: An Assessment of the Issues,* Washington, D.C.: 1977, p. 80.
26. National Coal Association, *Coal Traffic Annual—1977,* Washington, D.C.: 1978 pp. 3–5. Also see text, Table 24, Footnote b.
27. Estimate developed for the NTPSC by Peat, Marwick, Mitchell, May 1979.
28. *Railway Age,* July 31, 1978, p. 24.
29. Ohio River System includes the Ohio, Monongahela, Kehawha, Kentucky, Green and Barren Rivers.
30. Tippetts-Abbett-McCarthy-Stratton, "Steering Committee Briefing" for *Mid-America Ports Study* for U.S. Maritime Administration, July 1978.
31. Economics Branch of North Central Division of the U.S. Army Corps of Engineers, 1978.
32. D. Ward Fuller, "The Great Lakes: A Valuable Link in the Inter-Modal Movement of Western Coal Eastward," 1978, pp. 4–5; Manalytics, Inc., *op. cit.*, p. 60; and Economics Branch of North Central Division of the U.S. Army Corps of Engineers, 1978.
33. Currently being reviewed by U.S. Office of Management and Budget.
34. Robert McIntyre, Economic Branch, North Central Division, U.S. Army Corps of Engineers, Interview: 1979.

35 U.S. Army Corps of Engineers, *Survey Study for Great Lakes and St. Lawrence Seaway Navigation Season Extension, Draft Main Report and Environmental Statement,* Detroit, Michigan: March 1979.

36. Congressional Research Service, *National Energy Transportation—Volume III, Issues and Problems,* Washington, D.C.: March 1978, Section 3.1.11, p. 125.
37. *Ibid.*, also see: Department of Energy, "Financial Analysis of Vertical Divestiture," September 1977, Contract No. EM–76–C–01–8387.
38. *Ibid.*, p. 147.
39. *Ibid.*, p. 5.
40. *Ibid.*, p. 333.
41. *Ibid.*
42. *Ibid.*, pp. 159, 189.
43. See (1) Minnesota Energy Agency, *The Minnesota Coal Study,* St. Paul, Minnesota: September 1978; (2) U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, *Coal Development in the Northern Great Plains: The Impact on Revenues of State and Local Governments,* prepared by Thomas F. Stinson and Stanley W. Voelker, Agricultural Economic Report No. 394, Washington, D.C.: January 1978; and (3) URS Company, *Coal Train Assessment: Final Report,* prepared for the Four Corners Regional Commission, Denver, Colorado: December 1976.
44. See (1) Appalachian Regional Commission, *An Assessment of the Effects of Coal Movement on the Highways in the Appalachian Region: Final Report,* prepared by Research Triangle Institute, North Carolina State University and Appalachian Regional Commission, Washington, D.C.: November 1977; (2) Kentucky Department of Transportation, *Kentucky's Coal Transportation Highway System, Fall 1977,* Report No. 5 in a series entitled *Freight Transportation in Kentucky,* Frankfort, Kentucky: March 1978; and (3) U.S. Congress, Senate, Committee on Environment and Public Works, *Highway Needs to Solve Energy Problems,* Report of the Secretary of Transportation in Compliance with Section 153 of the Federal-Aid Highway Act of 1976, Doc. No. 95–126, 95th Cong., 2d sess., Washington, D.C.: Government Printing Office, October 1978.

Forecasts of Future Transportation Activity

9

INTRODUCTION

This chapter presents transportation activity estimates—national, regional, and by transportation market—through the year 2000. The discussion focuses on general market and modal trends, but additionally provides limited discussion of region-specific detail. These NTPSC "baseline" forecasts assume status quo transportation policies.

ACTIVITY FORECASTS BY MARKET

NATIONAL OVERVIEW

For the base year 1975 and the forecast years 1985 and 2000, Table 26 displays data on GNP, population and its components, disposable personal income, the resultant transportation demand, the energy required to accommodate that demand, highway fatalities and air pollution levels in urban areas. The GNP, population component, and disposable personal income data were assumptions to the NTPSC's demand models. Person-miles, ton-miles, energy consumed, fatalities, and air pollution were model outputs.

Although the range of economic growth presented is wide, a central theme is discernible across the three scenarios. Demand for transportation in the form of person-miles and ton-miles is growing at a rate considerably faster than population. This is not surprising. Rising real income is expected to encourage more consumption of goods and more travel by individuals. Further, increases in the number of households relative to population should bring about more consumer goods purchases per capita, because the establishment of a household implies the purchase of certain basic items.

The effect of relative affluence on transportation energy consumption is clear. For the scenario showing the lowest transportation growth between 1975 and 2000, energy consumption will increase by 7 percent over the period. Improvements in modal efficiency are expected to almost compensate for the growth in traffic and there will actually be a decrease in Btus used in transportation per capita. In the medium-growth scenario, Btus per capita rise only slightly over the period, despite substantial growth in person-miles and ton-miles. Modal efficiency improvements will not, however, be enough to keep total transportation energy from growing. The scenario showing the highest level of growth indicates a large increase in energy requirements, both in an absolute sense and per capita. Gains in modal efficiency will be offset by the large growth in demand.

Fatalities on the nation's highways are forecast to grow as highway travel increases, despite reductions in the fatality rate per mile travelled. Meanwhile, air pollution levels are anticipated to decline due to Federal standards.

URBAN PASSENGER MOVEMENT[1]

Census figures show between 75 and 80 percent of the U. S. population lives in urban areas; thus the urban passenger market is by far the most visible to the largest number of people. Daily movements of persons in urban areas, by car, bus, rapid rail and commuter rail, presently generate about one-third of all person-miles travelled nationally. To forecast changes in this activity level to the year 2000, the TRANS model was used.

Underlying those forecasts is the philosophy of status quo government policy. However, the immense data appetite of TRANS necessitated some departure from this baseline. The only complete and consistent source of the urban data needed by the model is the Urban Data Supplement of the 1974 National Transportation Report (NTR).[2] Because the system-supply numbers in the NTR report represent needs as estimated by urban areas themselves, the values are not necessarily fiscally constrained or compatible with Federal expenditure policy. As the 1974 NTR provided needs estimates only to 1990, simple extrapolation beyond 1990s was used for both highway and transit supply. The result is a relatively small variation of values across scenarios.

Because the NTR includes only the largest 240 metropolitan areas in the U.S., NTPSC factored its TRANS results to reflect the Census definition of

TABLE 26. National overview, by scenario (1975, 1985, and 2000)

	Year			
	1975	1985	2000	2000/1975
Low-Growth Scenario				
GNP (billions of 1975 $)[a]	1529	2034	2342	1.53
Population (millions)[a]	214	229	246	1.15
Households (millions)[a]	71	79	89	1.25
Civilian Labor Force (millions)[a]	95	105	117	1.23
Disposable Personal Income per Capita (1975 $)[a]	5078	6195	6688	1.32
Person-Miles (trillions)[b]	2.6	3.2	4.2	1.62
Ton-Miles (trillions)[b]	2.4	3.1	4.0	1.67
Energy Consumed by Transportation (Quads)[c]	17.4	16.8	18.6	1.07
Highway Fatalities (thousands)[d]	46.0	47.7	56.1	1.22
Metric Tons of Air Pollutants in Urban Areas (millions)[e]	50.8	37.5	31.3	.62
Medium-Growth Scenario				
GNP (billions of 1975 $)[a]	1529	2276	3588	2.35
Population (millions)[a]	214	233	260	1.21
Household (millions)[a]	71	90	104	1.46
Civilian Labor Force (millions)[a]	95	109	124	1.31
Disposable Personal Income per Capita (1975 $)[a]	5078	6853	9826	1.94
Person-Miles (trillions)[b]	2.6	3.3	4.6	1.77
Ton-Miles (trillions)[b]	2.4	3.5	6.3	2.63
Energy Consumed by Transportation (Quads)[c]	17.4	17.7	22.3	1.28
Highway Fatalities (thousands)[d]	46.0	53.4	66.9	1.45
Metric Tons of Air Pollutants in Urban Areas (millions)[e]	50.8	38.8	38.6	.76
High-Growth Scenario				
GNP (billions of 1975 $)[a]	1529	2418	4474	2.93
Population (millions)[a]	214	229	246	1.15
Households (millions)[a]	71	92	105	1.48
Civilian Labor Force (millions)[a]	95	110	124	1.31
Disposable Personal Income per Capita (1975 $)[a]	5078	7429	13051	2.57
Person-Miles (trillions)[b]	2.6	3.4	5.0	1.92
Ton-Miles (trillions)[b]	2.4	3.8	7.7	3.21
Energy Consumed by Transportation (Quads)[c]	17.4	19.5	26.3	1.51
Highway Fatalities (thousands)[d]	46.0	55.2	75.2	1.63
Metric Tons of Air Pollutants in Urban Areas (millions)[e]	50.8	39.4	44.0	.87

[a] See Chapter 5.

[b] See Table 32.

[c] See Table 34. These values differ from those of Chapter 8 by about 10 percent. This results from differences in emphasis and accounting between two modeling approaches. Conclusions drawn in this chapter and Chapter 8 are not affected.

[d] See Figure 24.

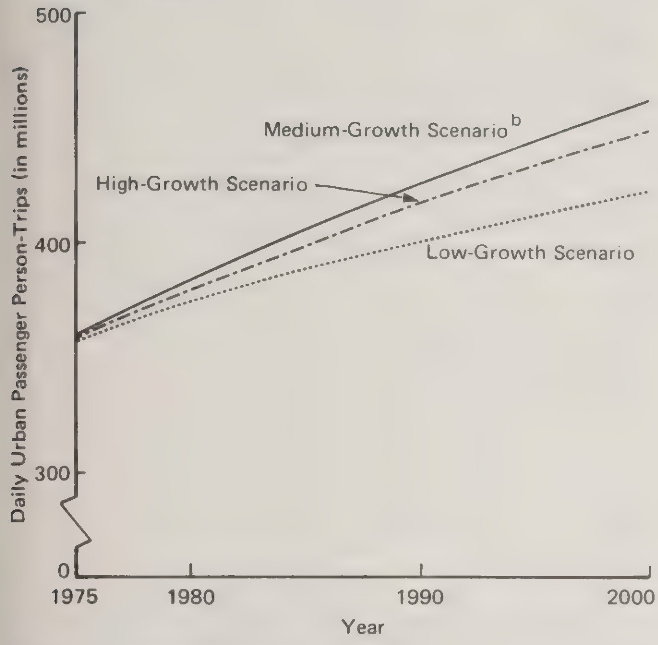
[e] See Chapter 8.

urban areas. The population of the 240 cities represents about 83 percent of what the Census considers urban.

Figure 18 illustrates that person trips in urban areas are expected to grow at a fairly steady rate over the 25-year period, 1975 to 2000. The growth will be directly proportional to changes in population, and the activity projected assumes no further controls on travel. This is consistent with the status quo notion of the NTPSC baseline.

Over all, about 7 percent of urban trips are expected to use transit during the forecast period. Differences among scenarios, generally less than 1/2 of a percent, are primarily the result of changes in highway congestion levels that are associated with differing population estimates. A closer look, by city type, helps explain these results. Figure 19 illustrates percentages of daily trips by transit for the base year and the year 2000, by city group, for the medium-growth scenario. With the exception of city group 5 (over 1,000,000 population), the percentage of transit travel is forecast to drop or remain the same between 1975 and 2000. The increase for city group 5 reflects an anticipated expansion of rail service.

FIGURE 18. Forecast urban person-trips, by scenario, 1975 to 2000.[a]



SOURCE: Based on Appendix Table 27.

[a] Urban includes 240 metropolitan areas of the U.S. See Department of Transportation, *1974 National Transportation Report, Urban Data Supplement,* Washington, D.C.: 1976, p. 2.

[b] The medium-growth scenario assumed a higher growth in population than the other two. This explains the higher value for urban trips in that scenario.

Appendix Figures 5 through 7 (and associated Appendix Tables 29 and 30) illustrate other urban transportation market changes. Appendix Figure 5 shows a fairly constant, moderate rate of growth in miles of urban arterials (including freeway-type facilities). However, as the number of miles increases, the number of miles of freeway-type facilities is expected to increase more rapidly in all city groups. Appendix Figure 7 illustrates the forecast growth in arterial capacity measured in hourly vehicle-miles. (That measure takes account of lanes as well as number of arterial miles.) Capacity grows faster than facility miles because the average capacity of new facilities is higher than for existing ones and the capacity of some existing facilities will be increased through TSM projects and reconstruction.

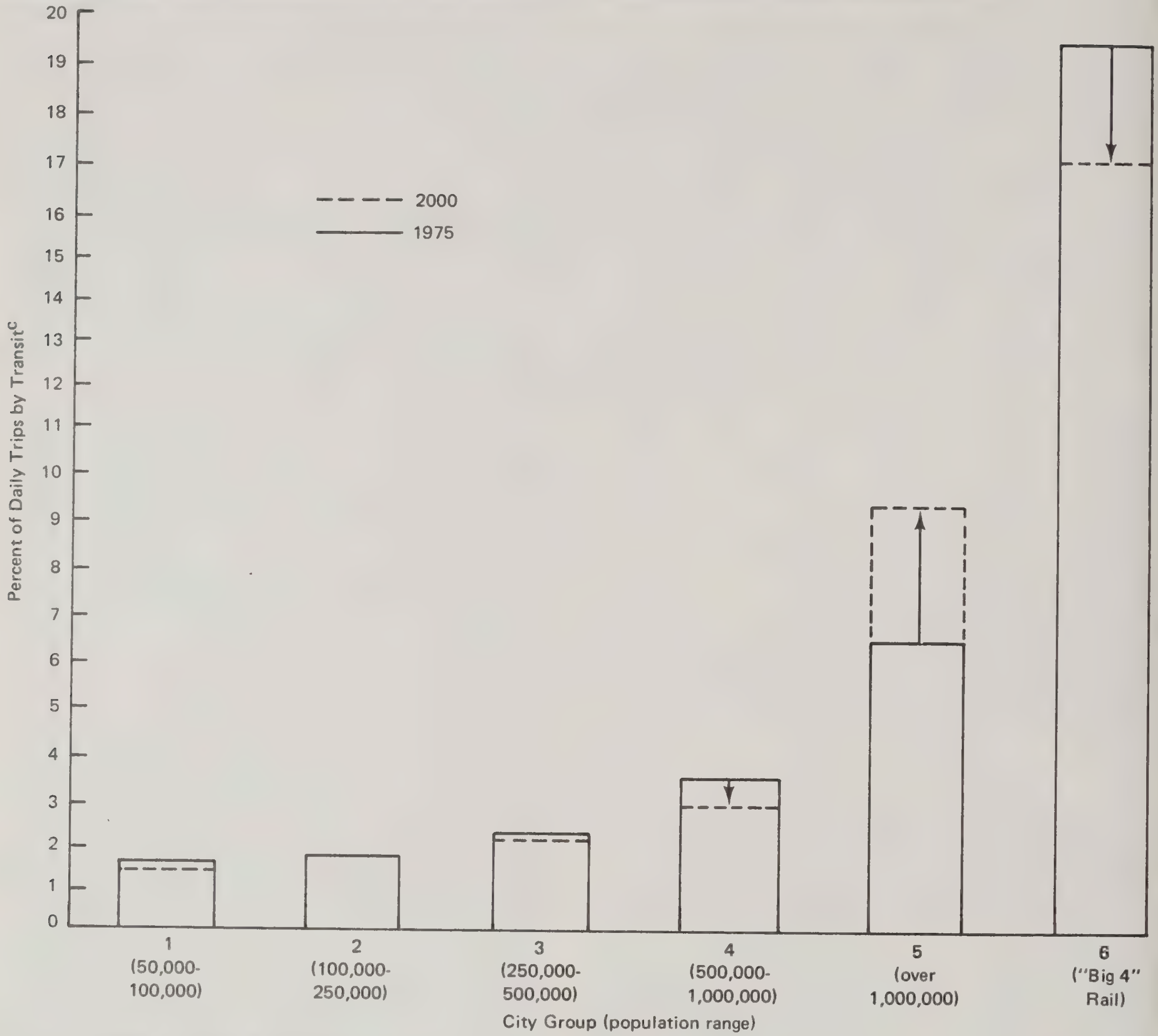
The supply of future transit service is specified primarily in terms of seat-miles provided by bus and rail. Figure 20 shows seat-miles of service on an average weekday in urban areas by bus and rail transit and commuter rail. As with highways, these data are based on the 1974 NTR. The growth rate for bus seat-miles is forecast to decline somewhat after 1980, but for rail, seat-miles will increase slightly after 1980. Rail seat-miles are anticipated to constitute about half of total transit seat-miles by 2000, more than doubling during the 1975 to 2000 period. The relatively high growth in rail service can be attributed to new rail systems in a number of areas which are now without such service, but expect it in the future.[3]

These system changes will affect average highway speeds as indicated in Figure 21 and Appendix Figure 8. (Differences among scenarios are small and thus not shown.) During the 1975 to 2000 period, weighted average speeds on freeways and surface arterials in peak hours are expected to drop 3.3 m.p.h. This indicates that the increase in arterial travel is not, on average, matched by a commensurate increase in arterial capacity during peak periods. However, forecast average speeds during the off-peak will increase 4.5 m.p.h., which may be due to the increase in freeway mileages. The decline in average peak arterial speeds forecast at the national level is not true for every city group. In most groups, the increase in capacity, and percent of capacity which is freeway, overcomes the expected increase in traffic. However, for cities over one million population the base-year peak speeds are relatively low and are anticipated to drop quite a bit by the year 2000. (See Appendix Table 32.) These larger metropolitan areas are expected to opt for increased rail transit rather than improved highway systems, with the net effect of decreasing peak-period highway speeds.

It is a safe assumption that the U.S. will remain an auto-oriented society. Whether people buy cars, trucks or vans, the personal passenger vehicle seems likely to continue to dominate the urban transport market. A simple trend extrapolation would result in 0.583 autos per capita in the year 2000. This is still below the 0.6 to 0.7 autos per capita of today's highest income groups. All three scenarios show average income rising faster than the average cost of owning and operating a car. Demographic shifts are toward smaller households. Average age is rising with more people reaching driving age. The net results are the projections in Figure 22 of the urban personal vehicle fleet. Implications of the ever-growing number of vehicles in terms of fuel requirements are displayed in Figure 23.

If the fleet remains primarily gasoline powered, energy consumption is expected to return to 1975 levels by 2000 after dropping during intermediate years, despite improvements in modal efficiency required by Federal standards. Greater gas mileage per gallon will be more than offset by more travel. If use of diesel becomes more significant, as NTPSC forecasts suggest, transportation energy consumption in urban areas can be expected to drop below 1975 levels in 2000. Air pollution was discussed in Chapter 7.

FIGURE 19. City group[a] comparison of 1975 and year 2000 medium-growth scenario[b] forecasts, by modal split.



SOURCE: Based on Appendix Table 28.

[a] City groups defined in terms of population expected in 1990.

[b] Virtually the same for all scenarios.

[c] Transit includes commuter rail.

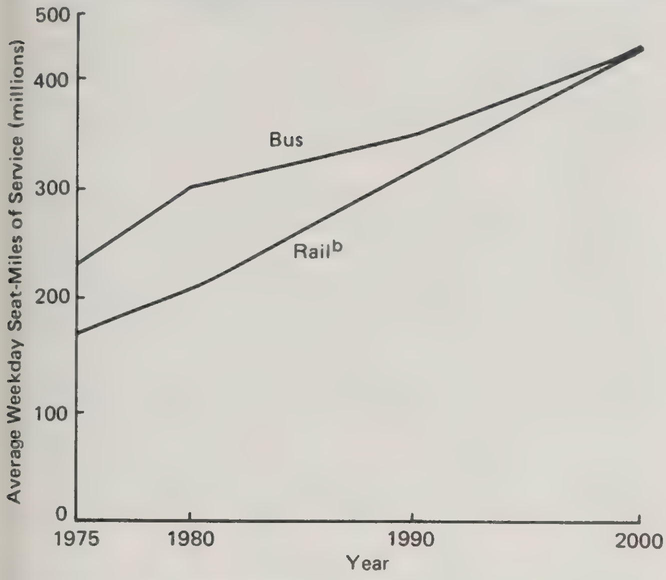
As Figure 24 shows, fatalities due to auto accidents in urban areas are expected to rise steadily over the forecast period. This assumes that the effects of projected increases in traffic will not be fully counteracted by safety improvements.

URBAN GOODS MOVEMENT

Urban goods movement is defined as the transport of goods and services within urbanized areas. Movements are generally by truck and include those from wholesalers to retailers, retailers to customers, urban pickup and delivery operations of for-hire and private carriers, and service-related trucking. Excluded are: (1) shipments of goods by personal vehicles (e.g., shopping trips); (2) shipments on other than the conventional surface transportation modes (e.g., gas, water and electricity); and (3) through shipments.

Although many discussions have focused on the subject, particularly its impacts on transport costs,

FIGURE 20. **Forecast urban transit seat-miles, 1975 to 2000.**[a]

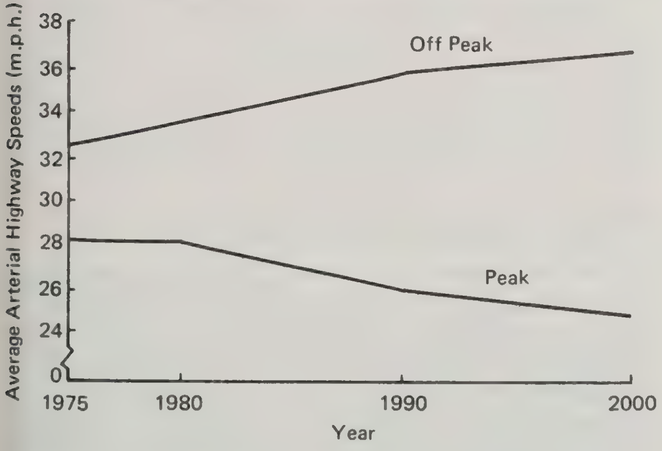


SOURCE: See Appendix Table 31.

[a] The same for all three scenarios. Includes both expansion of existing systems and building of new systems. The following cities have at least engineering money approved: Atlanta, Baltimore, Buffalo, Miami, Pittsburgh, Honolulu, and Cleveland. Based on U.S. Urban Mass Transportation Administration, Office of Program Analysis, telephone interview, 13 June 1978.

[b] Includes commuter rail.

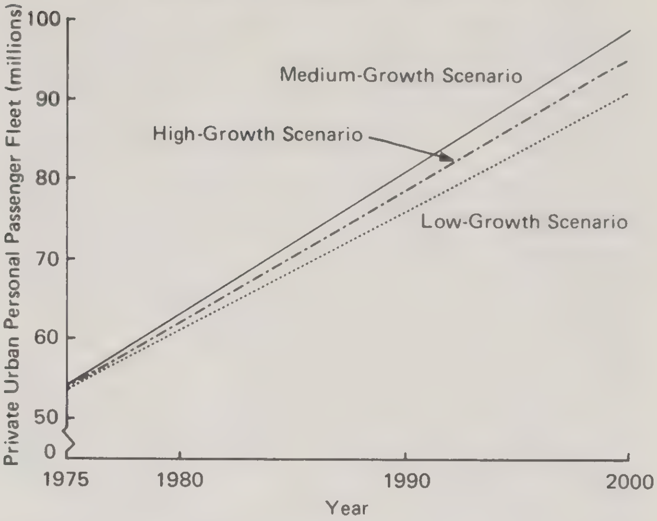
FIGURE 21. **Forecast average speeds on urban arterials, 1975 to 2000.**[a]



SOURCE: See Appendix Table 32.

[a] Forecast differences among scenarios insignificant. Medium-growth scenario used in constructing plot.

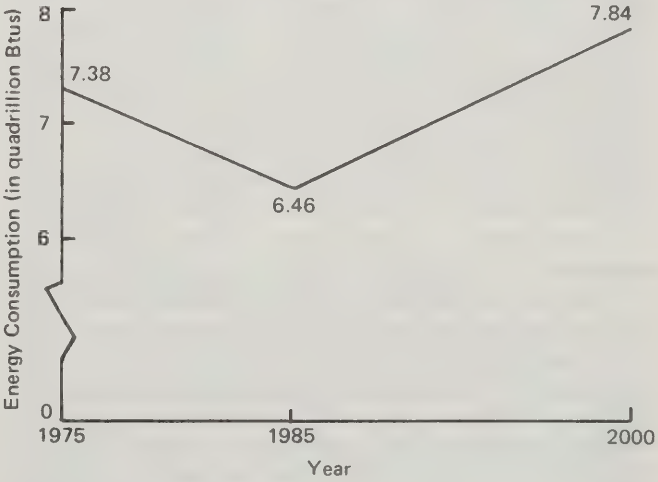
FIGURE 22. **Forecast fleet of private urban personal passenger vehicle, by scenario, 1975 to 2000.**[a]



SOURCE: See Appendix Table 33.

[a] Based on linear extrapolation of autos per capita using fleet size data from R. L. Polk, and census population data.

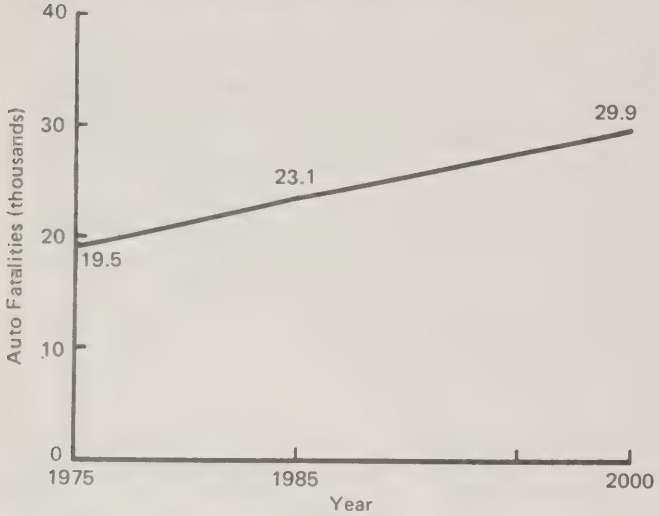
FIGURE 23. **Forecast urban personal passenger vehicle consumption of energy, 1975 to 2000.**[a]



SOURCE: NTPSC forecasts.

[a] Approximately the same for all scenarios.

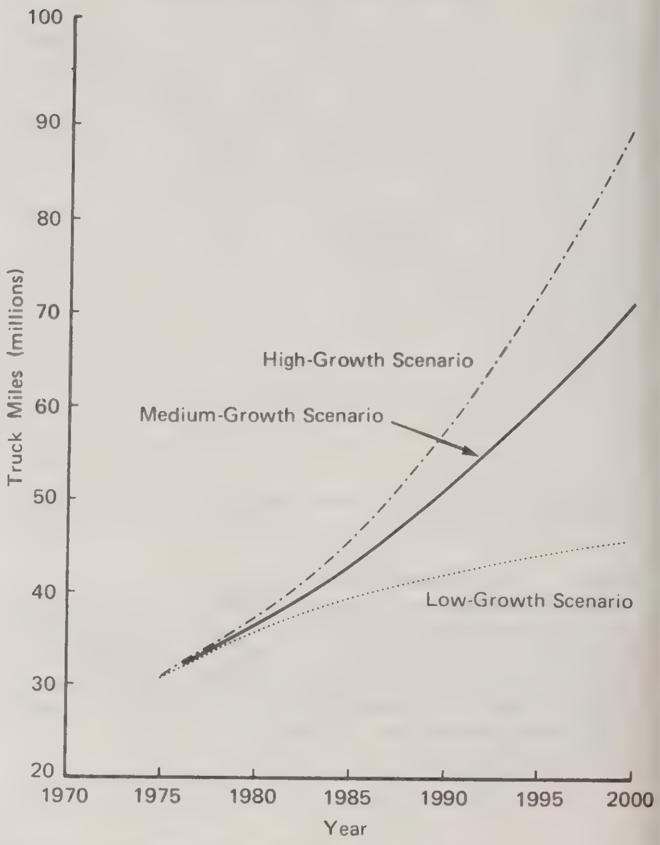
FIGURE 24. Forecast annual auto fatalities in urbanized areas, 1975 to 2000.[a]



SOURCE: NTPSC forecasts.

[a] 1975 values estimated using U.S. Department of Transportation, *National Transportation Statistics,* Washington, D.C.: November 1977 and the percent which is urban based on proportion of VMT in urban area. Future years based on traffic growth rates produced by TRANS model. Assumes number of fatalities per vehicle mile travelled drops to 2.8 by 1985 and remains constant to 2000. This implies introduction of some form of passenger restraint in autos. See U.S. Department of Transportation, *National Transportation Trends and Choices (to the year 2000),* Washington, D.C.: 1977.

FIGURE 25. Projections of truck-miles in urban goods movement by scenario 1975 to 2000.[a]



SOURCE: Appendix Table 34.

[a] Medium-growth scenario based on A. T. Kearney, Inc., *Urban Goods Movement Demonstration Project Design Phase IV,* Chicago, Illinois: 1976. Low and high scenarios based on adjustments according to GNP.

traffic congestion, energy consumption, air pollution, noise, and land use, little success has been achieved in collecting data. This is especially true at the national level.[4]

Figure 25 shows a larger number of truck-miles for the movement of goods in urban areas is expected as goods movement requirements increase. Because fleet size is projected to grow at a somewhat lower rate, average miles per truck will increase. This increase results primarily from changes in distribution patterns as terminal facilities, which were once located in central business districts, move to suburban areas with good access to freeway interchanges. Contributing to the increase in trucks are demands for lighter-density, high-value commodities and more frequent deliveries of smaller shipments.

More trucks on the urban street network is expected to be a problem. Reference to the number of truck-miles may understate localized impact on congestion and air pollution. Goods movement adds to congestion primarily on arterial streets at peak and midday hours and in central business districts at midday. Similarly, air pollution emissions may be concentrated in certain areas during peaks. Too, not only would the trucks add to the vehicles moving through the streets, but stops for pickups and deliveries can be devastating to smooth flows of traffic.

Total operating costs are expected to grow at a rate commensurate with growth in the fleet (see Appendix Figure 9). Fuel consumption represents about one-half quad. Differences over time and scenario are about one-fourth quad. These figures assume only slight improvements in modal efficiency.

INTERCITY PASSENGER MOVEMENT

For the purpose of this study, intercity passenger trips were defined as those greater than 30 miles and with a destination outside the urban or rural locality of origin. The NTPSC analysis separated the trips into those between 30 and 100 miles and those greater than 100 miles (partly because most trips less than 100 miles are by auto). While a simplified manual approach was used for the shorter trips, the method for longer trips was that developed for use in DOT's *National Transportation: Trends and Choices.*[5] This method generated trip origins and destinations for 171 Bureau of Economic Analysis regions (excluding Alaska and Hawaii) based on population; trip rates were adjusted to reflect level of affluence.

Tables 27 and 28 show projections of passenger-miles and passengers for intercity travel by mode. While all modes exhibit absolute growth, auto and air clearly dominate, accounting for over 97 percent of all intercity travel. The most significant shift is from auto to air, which grows at the highest rate. Large increases in air travel reflect the effect of more real income per capita. As income rises, the value of time rises, and air travel becomes more desirable because of its speed.

Table 29 shows fuel consumption by mode for intercity travel. As in the urban market, the effects of two countervailing forces are reflected in the numbers. On the one hand, improved auto and aircraft fuel efficiency reduce energy consumption. On the other hand, increased travel and the shift to air (the mode with highest Btus per passenger-mile) increase fuel use. In the low-growth scenario, with its relatively slow-growing economy, there is actually an absolute decrease in the number of Btus. In the medium and high-growth scenarios, the pressures of growth overshadow those of efficiency improvement, and fuel use rises. An interesting point shown in Table 29 is that, by the year 2000, air may replace auto as the dominant user of energy for intercity passenger travel.

TABLE 27. Forecast intercity passenger-miles, by scenario, 1975 to 2000 (billions)[a]

Mode	Year 1975	1985	2000
Low-Growth Scenario			
Air	148	192	257
Auto	1123	1258	1505
Bus	25	25	25
Rail	5	6	7
Total	1302	1481	1795
Medium-Growth Scenario			
Air	148	232	472
Auto	1123	1371	1830
Bus	25	27	31
Rail	5	6	6
Total	1302	1637	2340
High-Growth Scenario			
Air	148	268	651
Auto	123	1437	2145
Bus	25	30	34
Rail	5	7	10
Total	1302	1742	2840

SOURCE: NTPSC forecasts.

[a] 1975 values from U.S. Department of Transportation, Transportation Systems Center, *National Transportation Statistics,* Report No. DOT–TSC–OST–77–68, Cambridge, Massachusetts: November 1977, p. 8. Auto value obtained by subtracting urban and rural values from NTS national total. Future year values estimated using growth rates developed from passenger portion of NTP model. Air includes general aviation. Totals may not add due to rounding.

TABLE 28. Forecast intercity person trips, by scenario, 1975 to 2000 (millions)[a]

Mode	Year 1975	1985	2000
Low-Growth Scenario			
Air	282	359	476
Auto	12,976	14,883	18,149
Bus	239	243	244
Rail	31	34	41
Total	13,528	15,519	18,910
Medium-Growth Scenario			
Air	282	430	866
Auto	12,976	16,513	24,170
Bus	239	268	412
Rail	31	37	52
Total	13,528	17,249	25,499
High-Growth Scenario			
Air	282	493	1,209
Auto	12,976	17,656	29,541
Bus	239	294	334
Rail	31	39	64
Total	13,528	18,482	31,147

SOURCE: NTPSC forecasts.

[a] Estimated from passenger-miles of Table 27 and average trip lengths from NTP model. Air is not deregulated in these forecasts. Air includes general aviation. Totals may not add due to rounding.

INTERCITY FREIGHT MOVEMENT[6]

Intercity goods movement encompasses all non-local freight activity. Only the line-haul portion of the movement between primary collection points is included, with pick up and distribution at the origin and destination falling in the local freight category. NTPSC projections for this transportation market

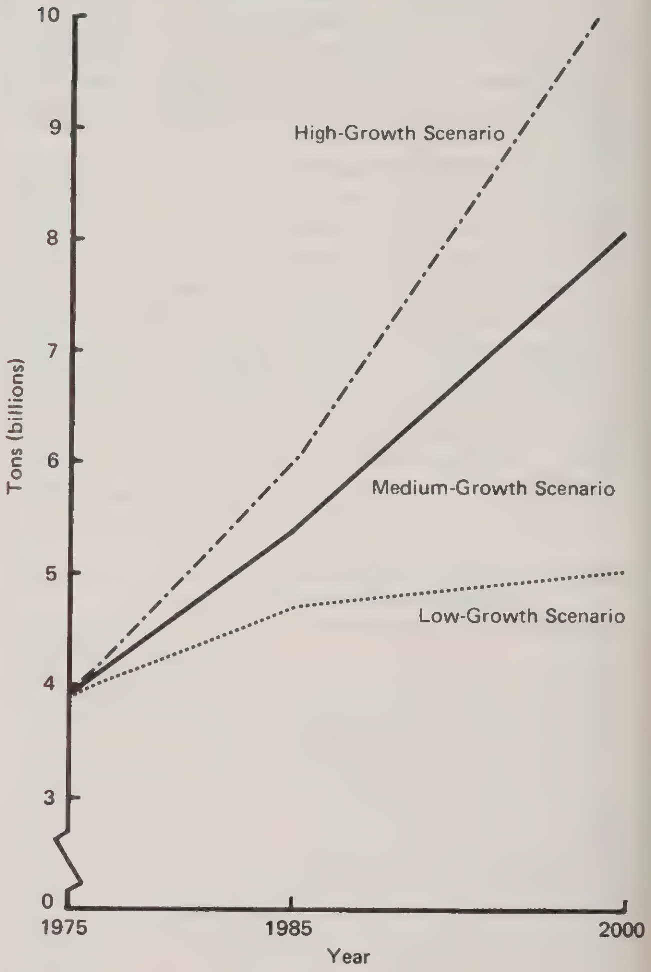
TABLE 29. Intercity passenger travel, energy consumption, by scenario, 1975 to 2000, Btus (quads)[a]

Mode	1975	1985	2000
Low-Growth Scenario			
Air	.97	1.25	1.29
Personal Vehicle	2.50	1.79	1.83
Bus	.03	.03	.03
Rail	.02	.02	.02
Total	3.52	3.10	3.18
Medium-Growth Scenario			
Air	.97	1.51	2.18
Personal Vehicle	2.50	2.01	1.78
Bus	.03	.03	.04
Rail	.02	.02	.03
Total	3.52	3.58	4.04
High-Growth Scenario			
Air	.97	1.74	3.01
Personal Vehicle	2.50	2.15	2.76
Bus	.03	.04	.04
Rail	.02	.02	.04
Total	3.52	3.95	5.85

SOURCE: NTPSC forecasts.

[a] Personal vehicles include autos, small trucks, and vans used primarily for passenger travel. Totals may not add due to rounding.

FIGURE 26. Forecast movements of intercity freight,[a] by scenario, 1975 to 2000.



SOURCE: NTPSC forecasts from TSC data and Inforum model growth rates. See Appendix Table 36.

[a] Goods movement includes the 19 commodity classes covered in the 1972 data base of the Transportation System Center of DOT. Intercity flows are those of sufficient length to cross Bureau of Economic Analysis region boundaries. Except for coal movement, which is covered in Chapter 8, shorter truck movements are covered in this chapter in the Urban Freight and Rural Freight sections. Shorter movements by pipeline, rail and water are not included. In 1975, these shorter movements which were not included accounted for about 12 percent of total ton-miles. See Appendix Tables 34 and 40.

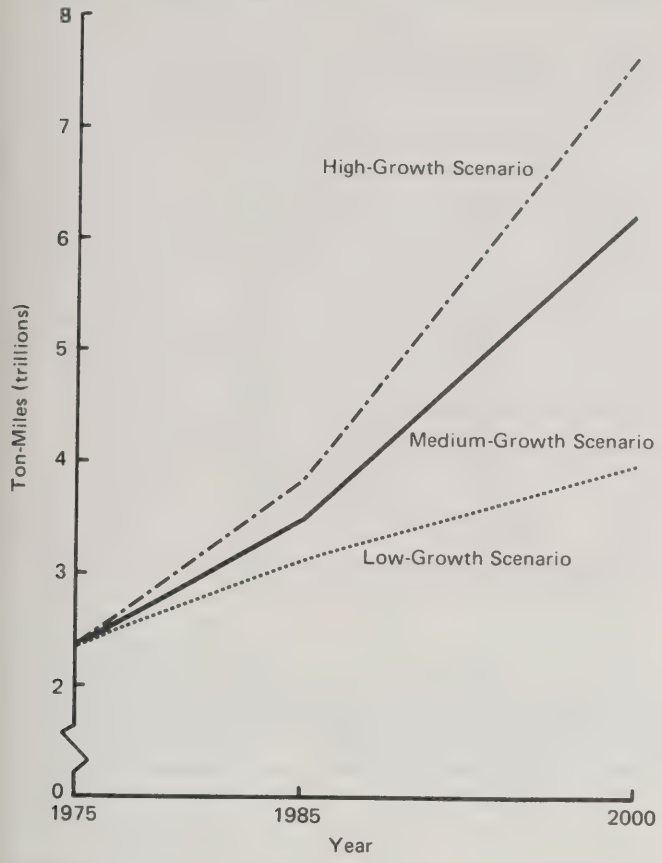
were generated using the NTP Freight Forecasting Model, which estimates the movements of freight between 173 regions for 19 commodity classes by mode. Energy commodities were estimated separately using the National Energy Model (NEM).

Figure 26 shows projected growth in total tons of commodities consumed. Ton-miles, as shown in Figure 27, grow 25 percent faster than tons. This implies increasing trip lengths over time. Meanwhile, energy required to move the freight, shown in Figure 28, is projected to rise more slowly than ton-miles, which reflects expected modal efficiency improvements.

Rail is expected to remain the dominant freight mode in terms of ton-miles to the year 2000. However, only in the high-growth scenario is rail to increase its market share. A close look shows the main ingredient in rail's future to be coal.[7] For the medium-growth scenario, if coal traffic were to be excluded, rail's share of intercity ton-mileage (carried by air, water, truck, and rail) would fall from 37.5 percent in 1975 to 32.7 percent in 1985 and 30.1 percent in 2000. Most important for the railroads is that coal traffic as a portion of total rail traffic is forecast by the NTPSC to rise in all scenarios, from 10.8 percent in 1975 to a range of 14 to 20 percent by 2000.

Water is the only mode other than rail to show a steady increase in share of ton-miles over time. As with rail, one commodity is critical to the growth. In this case, large movements of crude oil from Alaska are the important consideration. Because of these flows, water is forecast to succeed pipeline, in terms of ton-miles, as the primary mover of crude oil by 2000. However, it must be remembered that Alaskan

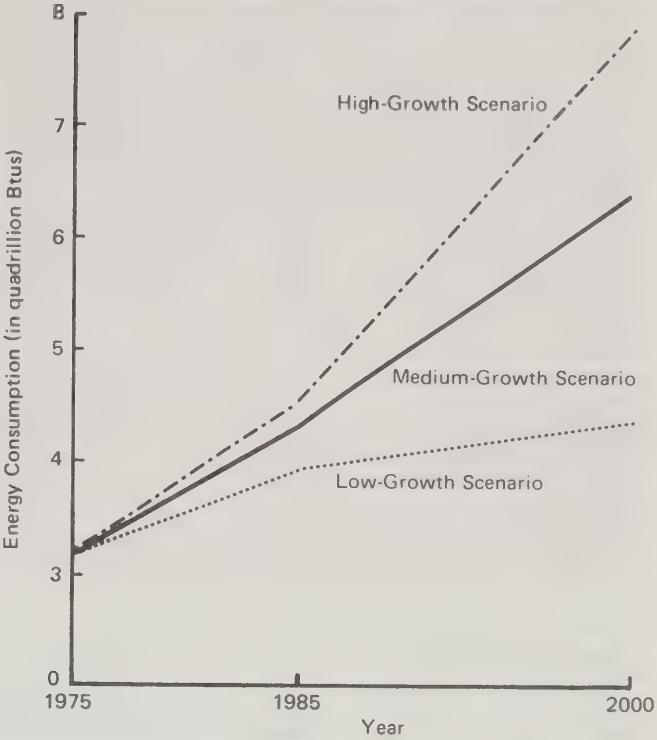
FIGURE 27. Forecast intercity freight ton-miles,[a] by scenario, 1975 to 2000.



SOURCE: See Appendix Table 37.

[a] Goods movement includes the 19 commodity classes covered in the 1972 data base of the Transportation System Center of DOT. Intercity flows are those of sufficient length to cross Bureau of Economic Analysis region boundaries. Except for coal movement, which is covered in Chapter 8, shorter truck movements are covered in this chapter in the Urban Freight and Rural Freight sections. Shorter movements by pipeline, rail and water are not included. In 1975, these shorter movements which were not included accounted for about 12 percent of total ton-miles. See Appendix Tables 34 and 40.

FIGURE 28. Forecast energy consumption by intercity freight transportation,[a] by scenario, 1975 to 2000.



SOURCE: See Appendix Table 38.

[a] Goods movement includes the 19 commodity classes covered in the 1972 data base of the Transportation System Center of DOT. Intercity flows are those of sufficient length to cross Bureau of Economic Analysis region boundaries. Except for coal movement, which is covered in Chapter 8, shorter truck movements are covered in this chapter in the Urban Freight and Rural Freight sections. Shorter movements by pipeline, rail and water are not included. In 1975, these shorter movements which were not included accounted for about 12 percent of total ton-miles. See Appendix Tables 34 and 40.

oil movements have long average trip lengths, so the change does not imply a shift of oil tonnage from pipelines to ships. This effect can be seen in Tables 30 and 31. Ton-miles of petroleum in the year 2000 are forecast at 2.3 to 4 times their 1975 level, depending upon the scenario. Meanwhile, tons are anticipated to grow only by 30 to 60 percent in the medium and high scenarios, and decline slightly in the low-growth scenario. Though not as dramatic, coal also shows an increase in average trip length by the year 2000. This is due primarily to large movements of western coal. Thus, two primary energy commodities will require more transportation, and therefore, more energy to get them to market. In terms of Btus delivered per ton of energy source produced, there is a decline due to the longer trip lengths despite improvements in overall energy efficiency.

While trucking shows an absolute growth in ton-miles over time, its expected share in 2000 is about the same as in 1975. The reason is that the commodities experiencing the highest growths are carried primarily by rail and water. No major shift of mode is implied for any commodity.

Pipeline's share of ton-miles is forecast to decrease, though in absolute terms there are considerable increases. Movement of Alaskan crude by ships, where pipeline is not an option, accounts for this.

RURAL PASSENGER MOVEMENT

Rural passenger movement is defined as the local movement of persons in non-urban areas. Local

TABLE 30. Ratios of tons of commodities transported, by scenario, 2000 compared to 1975[a]

Commodity	Scenario			Rank in 1975	Rank in 2000
	Low	Medium	High		
Forestry & Fisheries Prod.	.7306	1.179	1.704	15	17
Petroleum & Coal Prod.	.9400	1.311	1.523	1	2
Petroleum	.8470	1.344	1.634	2	5
Food Kindred Products	1.478	1.938	2.200	7	8
Metallic Ores	1.222	2.042	2.828	5	6
Lumber & Furniture	1.273	2.072	2.829	11	11
Primary Metal Prod.	1.299	2.132	2.767	8	9
Electrical Machinery	1.318	2.270	3.009	16	16
Textile Mill Prod. & App.	1.366	2.340	3.188	17	15
Paper and Allied Prod.	1.587	2.460	3.340	10	10
Farm Prod. & Field Crops	1.867	2.508	3.078	9	7
Fabricated Metal Prod.	1.551	2.512	3.208	12	12
Non-Electric Machinery	1.625	2.647	3.420	14	14
Transportation Equipment	1.320	3.224	2.871	13	13
Non-Metallic Minerals	1.114	3.333	4.544	4	3
Coal	1.883	3.499	4.749	3	1
Chemical & Allied Prod.	2.260	3.660	5.100	6	4
Total Commodities	1.323	2.174	2.804		

SOURCE: NTPSC forecasts.

[a]Based on NTP model results and Inforum model growth rates. Goods movement includes the 19 commodity classes covered in the 1972 data base of the Transportation System Center of DOT. Intercity flows are those of sufficient length to cross Bureau of Economic Analysis region boundaries. Except for coal movement, which is covered in Chapter 8, shorter truck movements are covered in this chapter in the Urban Freight Movement and Rural Freight Movement sections. Shorter movements by pipeline, rail and water are not included. In 1975, these shorter movements, which were not included, accounted for about 12 percent of total ton-miles. See Appendix Tables 34 and 40. Primary mode is the one which has the largest number of ton-miles for the given commodity class. Rank indicates ordering on the basis of total tons to be moved.

TABLE 31. Ratios of ton-miles of commodities, by scenario, 2000 compared to 1975[a]

Commodity	Scenario			Primary Mode	
	Low	Medium	High	1975	2000
Forestry & Fisheries Prod	.671	1.083	1.565	Water	Water
Petroleum & Coal Prod.	1.107	1.581	1.840	Pipeline	Pipeline
Petroleum	2.300	3.650	4.080	Pipe/water	Water
Food & Kindred Prod.	1.489	1.952	2.216	Rail	Rail
Metallic Ores	1.526	2.549	3.531	Water	Water
Lumber & Furniture	1.254	2.040	2.787	Rail	Rail
Primary Metal Prod.	1.312	2.153	2.794	Rail	Rail
Electrical Machinery	1.302	2.244	2.976	Truck	Truck
Textile Mill Prod. & App.	1.383	2.373	3.230	Truck	Truck
Paper and Allied Prod.	1.604	2.496	3.376	Rail	Rail
Farm Prod. & Field Crops	1.869	2.510	3.081	Rail	Rail
Fabricated Metal Prod.	1.557	2.522	3.222	Truck	Truck
Non-Electric Machinery	1.674	2.727	3.524	Truck	Truck
Transportation Equipment	1.298	3.172	2.820	Rail	Rail
Non-Metallic Minerals	2.234	3.524	4.803	Water	Rail
Coal	2.743	5.561	7.886	Rail	Rail
Chemicals & Allied Prod.	2.260	3.660	4.860	Rail	Rail

SOURCE: NTPSC forecasts.

[a]Based on NTP model results. See Table 30 for explanation.

movements are those which occur within a short distance of a residence, store, farm, factory, mine, or place where a vehicle is parked. In view of the limited availability of public transportation, mainly automobiles and small vans or pick-up trucks are used. Through travel and intercity trips are excluded.

Given no readily available source of information, a simplified approach was employed for estimating the magnitude of these movements over time. It was assumed that local VMT per person was the same in rural areas as in urban areas. This assumption, arising from the notion that there are fewer trips per capita but longer trip lengths than in urban areas, provided a manageable approach to the problem. Values for fuel consumption and pollution emission rates were the same as those noted in the section on urban passengers. However, because speeds are higher on rural roads than on urban streets, these estimates of energy used and air pollution generated are probably high.

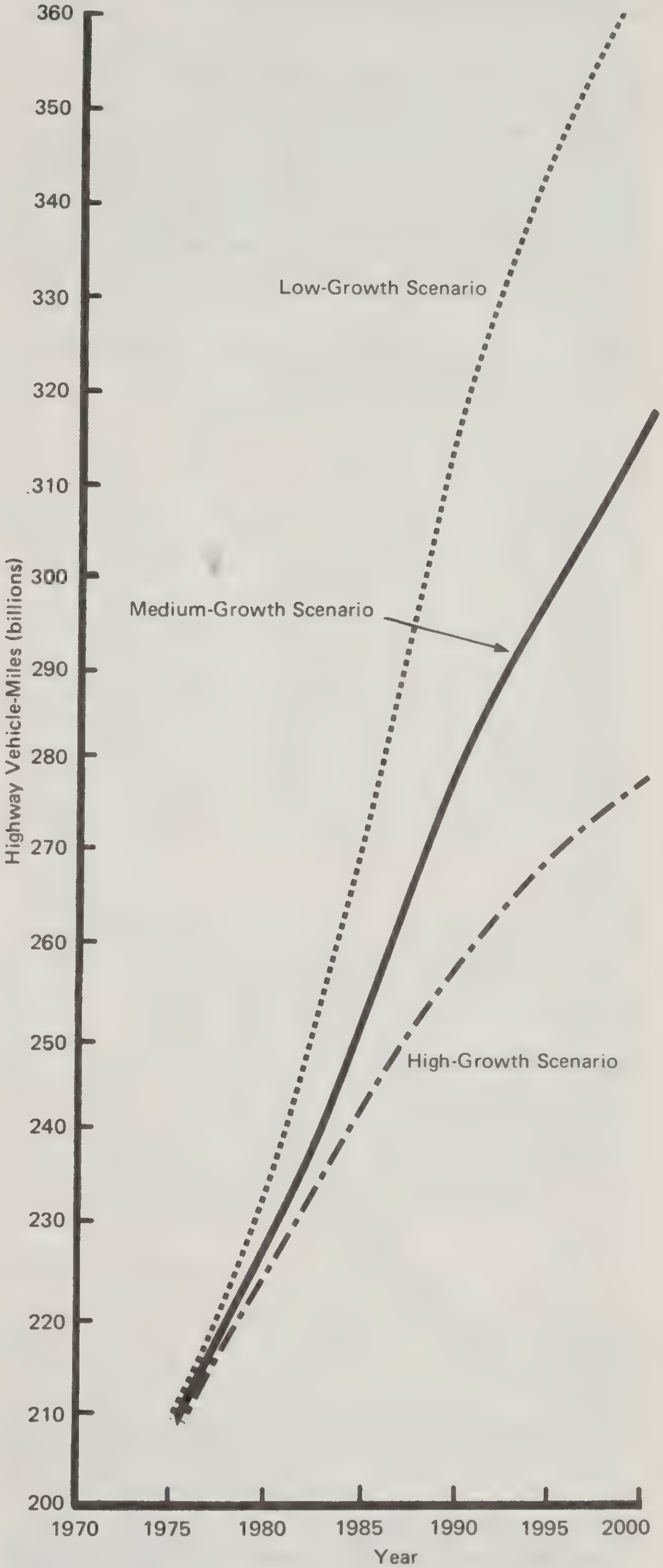
The forecast vehicle-miles of travel for rural passenger movement, which represented about 30 percent of total travel on rural roads in 1975 and about 20 to 25 percent by 2000, grow for all three scenarios between 1975 and 2000. (See Figure 29.) Interestingly, the scenario with the highest economic growth has the lowest VMT in 2000. This results from the lower rural population of the high-growth scenario. Assuming only small changes from gasoline to diesel-powered vehicles, energy consumption is to stay approximately at 1975 levels, which implies the mandated fuel economy standards are sufficient to counteract the growth in travel. Introduction of substantial numbers of diesel vehicles could lower energy consumption.

RURAL GOODS MOVEMENT

Rural goods movement is defined as the local movement of goods in non-urban areas. These movements are largely between production (or consumption) sites and long-haul intercity modes. Trucks are generally used. Movements excluded are: (1) transportation of goods by private auto (e.g., shopping trips); (2) outside the conventional surface transportation system (e.g., gas, water, and electricity); and (3) through shipments.

Discussions have focused on the role of rural goods movement in the transportation of agricultural and energy resources, but little effort has been made to collect data in the market. However, a 1976 report[8] in which total local goods movement by truck is examined makes it possible to estimate rural movement. Two important assumptions were made: (1) that the rural mix of diesel and gasoline trucks used for local goods and service delivery is the same as the urban mix; and (2) that the average annual miles travelled per truck remains constant over time,

FIGURE 29. Forecast rural passenger travel, by scenario, 1975 to 2000.[a]



SOURCE: See Appendix Table 39.

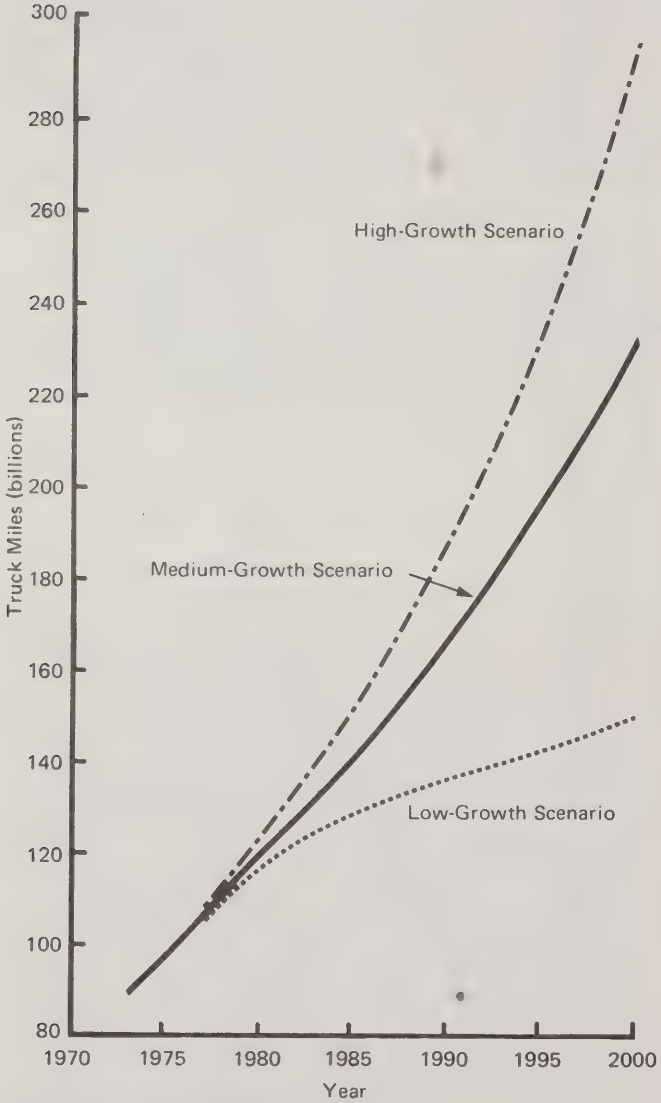
[a] Includes only travel with both ends of the trip in the same rural locality; does not include intercity.

which implies that there will be no major change in truck operations. Projections of rural goods movement by truck are shown in Figure 30.

INTERMARKET CONSIDERATIONS

Having examined each of the national transportation markets separately, it is instructive to assume a broader perspective and consider their relative magnitudes and interactions. Table 32 shows the NTPSC's forecasts of person-miles and ton-miles, by market, for each scenario. Personal demand for

FIGURE 30. Forecast of truck-miles in rural goods movement,[a] by scenario, 1975 to 2000.



SOURCE: Appendix Table 40.

[a] Medium-growth scenario results based on reports cited at Appendix II, Figure II–13 (see Appendix II footnotes 1 to 5). High- and low-growth scenarios estimated based on GNP.

TABLE 32. Forecast person-miles and ton-miles, by market and scenario, 1975, 1985, and 2000, and percent change (trillions)

	1975	1985	2000	Ratio 2000/1975
Low-Growth Scenario (All modes, annual)				
Person-Miles				
Urban Local[a]..	.81	1.10	1.58	1.95
Rural Local[b]...	.46	.60	.81	1.76
Intercity[c]	1.30	1.49	1.80	1.38
Total	2.57	3.19	4.19	1.63
Ton-Miles				
Urban Local[d]..	.014	.022	.027	1.93
Rural Local[e]...	.005	.007	.008	1.60
Intercity[f]..........	2.342	3.103	3.979	1.70
Total	2.361	3.132	4.014	1.70
Medium-Growth Scenario (All modes, annual)				
Person-Miles				
Urban Local[a]..	.81	1.11	1.58	1.95
Rural Local[b]...	.46	.56	.70	1.52
Intercity[c]	1.30	1.64	2.36	1.82
Total	2.57	3.31	4.64	1.81
Ton-Miles				
Urban Local[d]..	.014	.026	.043	3.07
Rural Local[e]...	.005	.008	.011	2.20
Intercity[f]..........	2.342	3.480	6.210	2.65
Total	2.361	3.514	6.264	2.65
High-Growth Scenario (All modes, annual)				
Person-Miles				
Urban Local[a]..	.81	1.11	1.58	1.95
Rural Local[b]...	.46	.53	.61	1.33
Intercity[c]	1.30	1.75	2.85	2.19
Total	2.57	3.39	5.04	1.96
Ton-Miles				
Urban Local[d]..	.014	.029	.058	4.14
Rural Local[e]...	.005	.008	.013	2.60
Intercity[f]..........	2.343	3.801	7.616	3.25
Total	2.361	3.838	7.687	3.26

[a] See Figure 18, note a.

[b] See Figure 28, note a.

[c] See Table 27, note a.

[d] Medium-growth scenario based on A.T. Kearney, Inc., *Urban Goods Movement Demonstration Project Design Phase IV*, Chicago: March 1976. Low- and high-growth scenarios based on adjustments according to GNP. Ton-miles per truck-mile computed in 1975. That ratio multipled by truck-miles in future years yields the corresponding ton-miles.

[e] Medium-growth scenario results based on reports cited in note d and footnote 6. Low- and medium-growth scenarios results based on GNP. Ton-miles per truck-mile computed in 1975. That ratio multipled by truck-miles in future years yields the corresponding ton-miles.

[f] See Footnote 6.

transportation appears almost equally divided between local and intercity travel. However, as 85 to 90 percent of all passenger-miles are by auto, examination of highway vehicle-miles is illuminating. Table 33, for the medium-growth scenario, shows that personal vehicles account for over 80 percent of national highway travel. Urban passenger vehicles represent a little less than half of all vehicular miles of travel and about two-thirds of all local travel. This is not surprising considering the relatively low vehicle occupancy rates (between 1.2 and 1.5) in most urban areas.[9]

TABLE 33. Forecast highway VMT by market for medium-growth scenario, 1975, 1985, and 2000 and percent change (trillions of vehicle-miles)

	1975	1985	2000	Ratio 2000/ 1975
Urban Local				
Personal Vehicle[a]	.63	.86	1.22	1.94
Truck[b]	.03	.04	.07	2.33
Total	.66	.90	1.29	1.95
Rural Local				
Personal Vehicle[c]	.21	.25	.32	1.52
Truck[d]	.10	.14	.24	2.40
Total	.31	.39	.56	1.81
Intercity				
Personal Vehicle[e]	.37	.46	.61	1.65
Truck[f]	.06	.10	.15	2.50
Total	.43	.56	.76	1.77
National				
Personal Vehicle	1.21	1.57	2.15	1.69
Truck	.19	.28	.46	2.42
Total	1.40	1.85	2.61	1.79

[a] See Table 32, note a.

[b] See Appendix Figure 9, note a.

[c] See Figure 28, note a.

[d] Results based on reports cited in footnotes 4 and 8.

[e] See Table 27, note a. VMT estimated by dividing vehicle occupancy into passenger-miles. Vehicle occupancy estimated by using overall occupancy obtained from *National Transportation Statistics,* November 1977, Figures 4 and 5. As Trans indicated urban auto occupancy at about 1.3, and NTS implied overall occupancy at about 2.2, intercity occupancy was assumed to be about 3.

[f] 1975 total national truck VMT for movement of freight from Oakridge National Laboratory, *Transportation Energy Conservation Data Book: Edition 2,* prepared for U.S. Energy Research and Development Administration, Report No. ORNL–5328, Oak Ridge, Tennessee: 1977, Figure 1–2. Urban and rural local truck VMT subtracted from national VMT to get intercity truck VMT. Future values estimated using a growth rate based on growth in intercity truck ton-miles.

Freight transportation demand, in ton-miles, is virtually all in the intercity sector. However, this is somewhat misleading because ton-miles are not always an appropriate output measure, especially for local movement of goods. Local traffic would include messenger and repair services and other such non-weight-related activities. In urban areas, as can be calculated from data in Table 33, truck travel represents only about 5 percent of the total VMT. However, its effect on congestion and air pollution is disproportionate to the volume, due to loading and unloading. For rural roads, however, the story is quite different. Most intercity truck travel takes place on non-urban (or rural) roads. Thus, looking at the rural, local and intercity markets, trucks constitute about 20 to 30 percent of the highway traffic.

In terms of energy consumption, Table 34 shows passenger travel to be the largest user, with the urban market being dominant. In 1975, personal travel consumed about 70 percent of national transportation energy. Personal passenger vehicles used about 60 percent of the total Btus. Urban personal passenger vehicles consumed about 40 percent. By 2000, these percentages are expected to drop to within the ranges of 50 to 60 percent, 40 to 50 percent, and 30 to 40 percent, respectively, which shows the effect of presently legislated standards for auto efficiency. However, except in the low-growth scenario, passenger-vehicle fuel consumption is anticipated to rise in absolute terms, despite efficiency improvements. This is due to the expected increase in travel.

While freight used only 30 percent of all national transportation energy in 1975, its growth is forecast to be considerably higher than that of passengers. By 2000, this percentage is expected to rise to between 35 and 45 percent depending on the scenario. This growth is explained by the lack of improvement in freight fuel efficiency. While there is room for savings, Table 34 suggests that passenger travel, and in particular the personal passenger vehicle, should receive the most attention for decreasing transportation energy requirements.

INTERNATIONAL AVIATION[10]

The process of developing international aviation projections was dependent on historic data and projected gross domestic product for Western Europe, Latin America, and Japan. Extensive use was also made of international air cargo forecasts developed by the U.S. DOT.

International aviation is one of the more volatile areas of transportation to forecast. Activity depends on the world economy, aviation costs, technology, and government policy. Traffic has grown dramatically over the last three decades. In constant dollars,

TABLE 34. Forecast domestic transportation energy consumption, by market and scenario, 1975 to 2000 (quads)[a]

	1975	1985	2000
Low-Growth Scenario (All modes, annual)			
Urban Local			
Passengers	7.83	6.92	8.01
Freight	.35	.38	.43
Total	8.18	7.30	8.44
Rural Local			
Passengers	1.42	1.22	1.30
Freight	1.16	1.22	1.28
Total	2.58	2.44	2.58
Intercity			
Passengers	3.52	3.10	3.18
Freight	3.15	3.91	4.36
Total	6.67	7.01	7.54
National			
Passengers	12.77	11.24	12.49
Freight	4.66	5.51	6.07
Total	17.43	16.75	18.56
Medium-Growth Scenario (All modes, annual)			
Urban Local			
Passengers	7.83	6.99	8.48
Freight	.35	.37	.62
Total	8.18	7.36	9.10
Rural Local			
Passengers	1.42	1.14	1.18
Freight	1.16	1.33	2.08
Total	2.58	2.47	3.26
Intercity			
Passengers	3.52	3.58	4.04
Freight	3.15	4.31	6.40
Total	6.67	7.89	10.44
National			
Passengers	12.77	11.71	13.70
Freight	4.66	6.01	9.10
Total	17.43	17.72	22.80
High-Growth Scenario (All modes, annual)			
Urban Local			
Passengers	7.83	6.97	8.17
Freight	.35	.73	.76
Total	8.18	7.70	8.93
Rural Local			
Passengers	1.42	1.12	1.09
Freight	1.16	2.18	2.54
Total	2.58	3.30	3.63
Intercity			
Passengers	3.52	3.95	5.87
Freight	3.15	4.51	7.84
Total	6.67	8.46	13.71
National			
Passengers	12.77	12.04	15.13
Freight	4.66	7.42	11.14
Total	17.43	19.46	26.27

SOURCE: NTPSC estimates.

[a] See Footnote 6 for definition of goods movements. These estimates do not include any government or international use of transportation energy. Overall, items not included accounted for about 1-1/4 quads in 1975.

the cost of international aviation has declined and, with each decline, a larger share of the population has taken advantage of international travel. As aircraft size, range and fuel efficiency have changed, a restructuring of the international market has resulted. Traffic splits between U.S. and foreign airlines, offering scheduled or charter service, reflect policy decisions made by government agencies.

Table 35 shows the expected large growth in passenger travel over the 25-year forecast period. These projections are for all international activity, by both U.S. and foreign-flag carriers, scheduled and charter. Passengers are expected to increase from two to six times by 2000 depending on the scenario. Relative affluence will have a large effect. As average incomes rise and fares decline, international travel becomes a viable choice for more people. As shown in Appendix Table 41, the rate of growth in passenger miles is expected to exceed the rate of growth in numbers of passengers, reflecting longer trips.

More overseas freight is expected to travel by air. Tons of cargo moving to and from the U.S. are expected to increase from three to ten times between 1975 and 2000 depending upon the scenario (see Appendix Table 42). Again, affluence appears to play a large role in the growth. With ton-miles growing faster than tons, substantial increases are indicated in all-cargo aircraft operations (see Appendix Table 43). In 1975, 89 percent of all freight capacity was on passenger planes; this fraction is expected to drop to between 31 and 47 percent by 2000. Exports account for about two-thirds of all U.S. international air freight traffic.

INTERNATIONAL MARITIME[11]

The NTPSC's forecasts of waterborne foreign trade and world merchant fleet activities are based primarily on those of the Maritime Administration. The assumptions MarAd used were found to be quite similar to those of the NTPSC's medium-growth scenario. For the other two scenarios, adjustments were made based on relative dollar values of imports and exports as indicated by the Inforum input-output model. The approach assumed all commodities traded were equally affected by changes from one scenario to another. That is to say, the adjustment factor, a function of total dollar value of trade, was applied equally to all commodities. No primary data collection or computer modelling were done by NTPSC.

Table 36 shows projected volumes of waterborne foreign trade. Imports and exports are forecast by coastal district. Forecasts were also made for several especially important commodities: exports of wheat and coal and imports of petroleum.

Table 37 shows the expected world and U.S. fleets by type of vessel. The overall increase in the number of ships required to carry U.S. foreign trade appears likely to be relatively small; however, changes are forecast in the fleet mix.

Overall, the U.S. maritime fleet's share of the total world fleet is forecast to rise from about 6.2 percent in the base year to about 9.8 percent by 2000. With expected changes in the mix of ships within the total U.S. fleet, there will be fewer general cargo ships but more partial-container and full-container ships, and neo-bulk, and LNG carriers. In 1975 there were no LNG carriers in the U.S. fleet, but the percentage of U.S. LNG carriers is expected to be about 54 percent of the world total by 1980, and to remain at about that percentage through 2000. The U.S. percentage of liquid bulk ships is forecast to increase from about 6 percent in 1975 to almost 10 percent by 2000. In 1975, the U.S. fleet contained some 85 percent of the world fleet of barge ships used to carry U.S. waterborne foreign trade, and that percentage is forecast to decline to 67.5 percent by 2000. Also, trends indicate increases in vessel size, particularly for container ships, dry-bulk carriers, combination carriers, and LNG carriers.

In general, forecasts anticipate a nominal increase in the U.S. maritime fleet participation in the carriage of U.S. waterborne trade, with major participation in barge ships, full container ships, and LNG carriers.

The next chapter provides estimates of the capital and other resource requirements to meet the activity levels forecast in this chapter.

TABLE 35. Forecast international aviation passengers, by market, by scenario, 1975 to 2000 [a](millions)

Market	Year						Ratio 2000/1975
	1975	1980	1985	1990	1995	2000	
Trans-Atlantic							
Low-Growth Scenario	10.7	14.2	16.0	17.2	18.3	19.3	1.80
Medium-Growth Scenario	10.7	14.9	18.7	28.0	28.3	34.0	3.18
High-Growth Scenario	10.7	15.3	20.4	27.3	36.7	47.5	4.44
Latin America							
Low-Growth Scenario	11.0	14.9	17.1	18.8	20.5	21.7	1.97
Medium-Growth Scenario	11.0	15.5	20.0	25.7	33.0	41.0	3.73
High-Growth Scenario	11.0	15.8	21.7	30.3	42.7	57.6	5.24
Trans-Pacific							
Low-Growth Scenario	4.1	5.8	7.0	8.1	9.1	10.0	2.44
Medium-Growth Scenario	4.1	6.2	8.3	11.0	14.3	18.1	4.42
High-Growth Scenario	4.1	6.5	9.5	13.8	19.7	26.9	6.56
U.S. Total							
Low-Growth Scenario	25.8	34.9	40.1	44.1	48.0	51.1	1.98
Medium-Growth Scenario	25.8	36.5	47.0	59.8	75.7	93.1	3.61
High-Growth Scenario	25.8	37.6	51.6	71.3	99.0	132.0	5.12

SOURCE: NTPSC Forecasts.

[a] Passengers entering or departing U.S. on U.S.- or foreign-flag carriers.

TABLE 36. Projected waterborne export and import trade by coastal district and scenario, 1975 to 2000 (millions of long tons)[a]

Export Trade	Year and Scenario															
		1980			1985			1990			1995			2000		
Coastal District	1975 (Base)	Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High
North Atlantic	63.6	68.5	70.6	72.7	76.8	84.4	90.3	82.5	100.6	112.7	90.2	120.2	143.0	97.8	143.9	179.9
South Atlantic	6.3	7.2	7.2	7.4	8.1	8.9	9.5	9.0	11.0	12.3	10.4	13.8	16.4	11.9	17.5	21.9
Gulf	94.7	110.9	114.3	117.7	125.5	137.9	147.6	135.8	165.6	185.5	150.2	200.3	238.4	165.2	242.9	303.6
California	15.4	17.1	17.6	18.1	18.6	20.5	21.9	19.7	24.0	26.9	21.7	28.9	34.4	24.1	35.4	44.3
Pacific Northwest	26.0	35.1	36.2	37.3	42.9	47.2	50.5	47.8	58.3	65.3	56.3	75.0	89.3	66.2	97.4	121.8
Great Lakes	31.5	34.7	35.7	36.8	36.3	39.8	42.6	36.5	44.5	49.8	37.5	50.1	59.6	38.8	57.0	71.3
Hawaii	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4
Alaska	2.0	2.7	2.8	2.9	3.1	3.4	3.6	3.4	4.1	4.6	3.7	5.0	6.0	4.2	6.2	7.8
Puerto Rico	0.7	1.1	1.1	1.1	1.3	1.4	1.5	1.4	1.7	1.9	1.6	2.1	2.5	1.7	2.6	3.3
Total	240.3	277.5	285.7	294.2	312.8	343.7	367.7	336.2	410.0	459.2	371.8	495.6	589.8	410.1	603.2	754.3

Import Trade	Year and Scenario															
		1980			1985			1990			1995			2000		
Coastal District	1975 (Base)	Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High
North Atlantic	155.1	270.7	279.1	287.5	276.7	304.1	325.4	263.8	321.7	360.3	263.6	351.5	418.3	264.2	388.5	485.6
South Atlantic	16.5	24.2	24.9	25.6	24.9	27.4	29.3	23.9	29.1	32.6	24.6	32.8	39.0	25.6	37.6	47.0
Gulf	118.8	116.6	120.2	123.8	124.6	136.9	146.5	120.8	147.3	165.0	122.8	163.7	194.8	125.3	184.3	230.4
California	36.5	61.3	63.2	65.1	64.0	70.3	75.2	61.2	74.6	83.6	60.4	80.5	95.8	59.5	87.5	109.4
Pacific Northwest	14.8	17.7	18.2	18.8	20.5	22.5	24.1	21.0	25.6	28.7	23.6	31.5	37.5	27.0	39.7	49.6
Great Lakes	19.2	25.2	26.0	26.8	26.9	29.6	31.7	24.6	30.0	33.6	25.1	33.4	39.8	25.8	38.0	47.5
Hawaii	4.4	9.1	9.4	9.7	9.2	10.1	10.8	8.8	10.7	12.0	8.6	11.5	13.7	8.4	12.4	15.5
Alaska	1.0	1.3	1.3	1.3	1.3	1.4	1.5	1.2	1.5	1.7	1.3	1.7	2.0	1.4	2.0	2.5
Puerto Rico	15.6	21.8	22.5	23.2	21.8	24.0	25.7	20.5	25.0	28.0	19.7	26.3	31.3	19.0	27.9	34.9
Total	381.9	547.9	564.8	581.8	569.9	626.3	670.2	545.8	665.5	745.5	549.7	732.9	872.2	556.2	817.9	1022.4

[a] 1975 and medium-growth scenario estimates came from: U.S. Maritime Administration, *A Long-Term Forecast of U.S. Waterborne Foreign Trade 1976–2000*, Washington, D.C.: November 1977; high- and low-growth scenario estimates based on growth rates in dollar values of foreign trade indicated by the INFORUM model.

TABLE 37. Forecast U.S. and world marine fleets, by ship type and scenario, 1975, and forecast, 1980 to 2000[a]

Ships	Year and Scenario															
		1980			1985			1990			1995			2000		
U.S. Marine Fleet	1975 (Base)	Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High
General Cargo Ships	106	78	80	82	69	76	81	30	37	41	14	18	21	12	18	23
Partial Containerships	20	16	16	16	25	27	29	33	40	45	42	56	67	48	71	89
Full Containerships	58	67	69	71	71	78	83	80	97	109	93	124	148	105	154	193
Barge Ships	23	18	19	20	20	22	24	20	24	27	20	25	31	18	27	39
Neo Bulk Containers	0	0	0	0	1	1	1	2	2	2	4	5	6	4	6	8
Dry Bulk Containers	3	6	6	6	17	19	20	23	28	31	31	41	49	37	55	69
Computation Carriers	2	2	2	2	2	2	2	2	3	3	2	3	4	2	3	4
LNG Carriers	0	6	6	6	21	23	25	25	31	35	29	39	46	30	44	55
Liquid Bulk Carriers	38	47	48	49	45	49	52	41	50	56	41	55	65	36	53	66
Total	250	240	246	252	271	297	317	256	312	349	276	366	437	292	431	546

Ships	Year and Scenario															
		1980			1985			1990			1995			2000		
World Marine Fleet	1975 (Base)	Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High	Low	Med.	High
General Cargo Ships	2043	1809	1865	1921	1497	1645	1760	1104	1346	1507	784	1046	1244	540	793	991
Partial Containerships	132	241	248	255	340	373	399	456	556	623	567	756	899	708	1042	1304
Full Containerships	181	251	259	267	276	303	324	301	367	411	322	428	509	346	509	637
Barge Ships	27	23	23	23	26	29	31	27	33	37	27	37	44	28	40	51
Neo Bulk Carriers	80	100	102	104	112	123	132	125	153	172	133	176	209	138	202	252
Dry Bulk Carriers	860	878	905	932	870	957	1024	810	988	1106	777	1033	1233	734	1080	1351
Computation Carriers	82	93	96	99	96	105	113	90	110	123	85	114	136	84	174	156
LNG Carriers	1	11	11	11	38	42	45	48	58	65	55	77	86	56	82	102
Liquid Bulk Carriers	643	780	805	830	700	770	824	614	749	839	532	706	843	373	548	686
Total	4049	4186	4314	4442	3955	4347	4652	3575	4360	4883	3282	4373	5203	3007	4470	5530

[a] Based on Temple, Barker, & Sloane, Inc., "*A Study of the Future Requirements for Ships That Will Be Engaged in the U.S. World Trade for Both the Short and Long Term,*" prepared for Office of Maritime Technology, U.S. Maritime Administration, Washington, D.C.: March 1976.

NOTES AND REFERENCES

1. Includes autos, small trucks, vans, bus mass transit, rail rapid mass transit, and commuter rail. Does not include taxis (7 billion person-miles in 1975) or school buses (2.7 billion vehicle-miles in 1975). Shopping trips are included.
2. U.S. Department of Transportation, *1974 National Transportation Report, Urban Data Supplement,* Washington, D.C.: Government Printing Office, 1976.
3. The following cities have at least engineering money approved: Atlanta, Baltimore, Buffalo, Miami, Pittsburgh, Honolulu, and Cleveland. Source: U.S. Urban Mass Transportation Administration, Office of Program Analysis, telephone interview, 13 June 1978.
4. For this study, one of the more complete reports on the subject was used as a basis. Done by A. T. Kearney, Inc. in 1976, the analysis projects urban goods movements from 1975 to 1990. NTPSC collected no primary data and did not use computer modelling. Rather, it found that conditions assumed in the Kearney report were similar to those in one of the current study scenarios. NTPSC adopted the Kearney projections for that scenario and then adjusted on the basis of GNP to obtain results for the other two scenarios. The basic Kearney assumptions are: (1) no change in intercity freight modal split occurs which would affect local distribution; (2) the vehicle fleet mix remains constant; (3) no significant changes in operating procedures occur; and (4) average vehicle fuel efficiency and air pollution emission rates remain fixed at 1973 levels. The NTPSC did not hold vehicle fuel efficiency constant over time, but otherwise accepted the assumptions. A. T. Kearney, Inc., *Urban Goods Movement Demonstration Project Design Phase IV (Input to National Transportation Plan),* Draft Report, Chicago, Illinois: March 1976.
5. U.S. Department of Transportation, Office of the Secretary, *National Transportation: Trends and Choices (To the Year 2000).* Washington, D.C.: Government Printing Office, 1977.
6. Goods movement includes the 19 commodity classes covered in the 1972 data base of the Transportation System Center of DOT. Intercity flows are those of sufficient length to cross Bureau of Economic Analysis region boundaries. Except for coal movement, shorter truck movements are covered in this chapter in the Urban Freight and Rural Freight sections. Shorter movements by pipeline, rail and water are not included. In 1975, these shorter movements which were not included accounted for about 12 percent of total ton-miles.
7. For data on modal splits of intercity ton miles forecast to 2000, see Appendix Table 37. While midwestern grain movements may also be important, the aggregated data base made singling out grain impossible.
8. Jack Faucett Associates, Inc., *Trucking Activity and Fuel Consumption—1973, 1980, 1985 and 1990,* prepared for Federal Energy Administration, Washington, D.C.: July 1976.
9. Peat, Marwick, Mitchell & Co., *An Analysis of Urban Area Travel by Time of Day,* prepared for U.S. Federal Highway Administration, Office of Planning, Report No. FH–11–7519, Washington, D.C.: January 1972, pp. C1–C40.
10. Includes all trips by U.S. or foreign-flag carriers with one trip end in the U.S. Canadian travel is not included. Trips by U.S. carriers with neither origin nor destination in the U.S. are not included.
11. Freight only. Includes trips of both foreign- and domestic-flag carriers originating in or destined for the U.S.

Capital Requirements for the Transportation Forecasts

10

INTRODUCTION

Forecasts of future U.S. transportation activity were presented in Chapter 9. Projections of capital requirements to support the forecast activity appear in this chapter. Table 38 summarizes the capital needs for each of the three NTPSC scenarios. Table 39 shows the government portion of the capital investments. None of the projections purport to predict the future; rather, they are intended to identify possible problem areas which may require changes in national transportation policy.

This chapter also discusses capital formation for transportation, because public and private capital availability appear to be an issue for most modes, while labor and land may impose constraints only in selected instances. Capital serves as an input to the production process; how it is used and its price influence the success of a firm's production and of a government's programs. This chapter examines these influences on the ability of firms to finance improvements from retained earnings, obtain capital from commercial sources, or use other means of capital acquisition.

PUBLIC HIGHWAY INVESTMENT

Highway expenditures account for the largest share of government transport costs. Public funds finance the building, maintenance, operation and administration of public roads.

Chapter 9 presented the NTPSC's forecast of road-oriented activity (i.e., vehicle-miles of travel, passenger-miles and ton-miles). Those forecasts were part of a series of inputs used to forecast highway capital needs and revenues.

CAPITAL AND OTHER EXPENDITURE NEEDS

Tables 38 and 39 contain capital needs data for highways. The discussion which follows is based on the medium-growth scenario. The forecasts in Chapter 9 and hence those in this chapter rest on the status quo assumption that sufficient highway capacity will be constructed to maintain present service levels for the remainder of the century. The estimates in Tables 38 and 39 were produced using as a base the data for 1976 to 1990 shown in Table 40 (from U.S. DOT estimates of highway capital). The NTPSC estimated the additional capital needed during the period 1990 to 2000 by using average capital per vehicle mile traveled during the 1976 to 1990 period and the forecast 1990 to 2000 growth in travel. The result was the $900 billion shown in Tables 38 and 39.

For comparison with Table 40, Table 41 contains higher and lower estimates for the 1976 to 1990 time period. The first column of Table 41 shows amounts of money reported by states as their needs in a survey conducted by DOT for the 1974 *National Transportation Report.* (Fifteen states updated their reported estimates in 1977.) The second column shows the results of an economic analysis conducted by DOT in 1972 of state-reported arterial and collector needs. The latter analysis indicated far less investment would be necessary in small urban and rural areas than did the other two estimates.

Appendix Table 44 shows in state-by-state detail the same two alternative sets of capital needs contained in Table 41.

HIGHWAY REVENUES

It appears that forecast revenues from highway user charges will be insufficient to maintain current levels of service on the nation's roads. The NTPSC estimated the nationwide revenues that might be available for total highway expenditures from now to the year 2000 under the medium-growth scenario with present revenue practices. The results are illustrated in Figure 31. The lower line (B) shows the amount of revenue that would be available from highway user-charge imposts. Automotive energy conservation and user charge rates which do not increase with inflation (Federal rates are shown in Appendix Table 45) hold down the growth in revenue in spite of expected growth in highway travel. The upper line (A) shows total available revenues. The difference between lines (A) and (B) is largely money from

TABLE 38. Transportation capital investment forecasts (millions of 1975 $)

Mode	Low-Growth Scenario			Medium-Growth Scenario			High-Growth Scenario		
	1976–1985	1986–2000	Total	1976–1985	1986–2000	Total	1976–1985	1986–2000	Total
Highways	288,978	567,993	856,971	294,411	606,035	900,446	297,129	633,210	930,339
Autos	640,628	1,147,164	1,787,792	647,615	1,181,452	1,829,067	652,725	1,199,683	1,852,408
For-Hire Trucks	27,719	45,439	73,158	34,249	75,249	109,498	35,092	93,367	128,459
Private Trucks	149,681	225,902	375,583	179,428	379,600	559,028	200,566	496,260	696,826
Intercity Buses	782	1,112	1,894	813	1,290	2,103	860	1,424	2,284
School Buses	1,832	2,512	4,344	1,856	2,785	4,641	1,823	2,512	4,335
Subtotal	1,109,620	1,990,122	3,099,742	1,158,372	2,246,411	3,404,783	1,188,195	2,426,456	3,614,651
Railroads	53,169	64,558	116,727	75,977	154,327	230,304	98,513	224,336	322,849
Ports, Harbors & Facilities	7,143	12,003	19,146	8,035	14,190	22,225	8,308	16,178	24,486
International Marine Equip.	4,880	8,757	13,637	6,204	13,144	19,348	6,591	17,659	24,486
Domestic Marine Equip.	5,797	9,909	15,706	7,290	17,270	24,560	8,005	19,433	27,438
Private Boats	8,894	18,397	27,291	9,735	23,716	33,451	9,939	26,111	36,050
Subtotal	26,714	49,066	75,780	31,264	68,320	99,584	32,843	79,381	112,224
Oil Pipelines	9,868	11,026	20,894	10,284	15,084	25,368	11,041	17,712	28,753
Gas Pipelines	4,730	34,810	39,540	1,880	48,448	50,328	6,560	48,310	54,870
Subtotal	14,598	45,836	60,434	12,164	63,532	75,696	17,601	66,022	83,623
Airports	11,964	15,962	27,926	13,531	21,110	34,641	14,788	24,077	38,865
Airways	2,578	4,611	7,189	2,760	5,286	8,046	2,924	5,874	8,798
Domestic Air Carriers	19,524	29,528	49,052	26,500	63,586	90,086	23,647	90,491	114,138
Int'l Air Carriers	12,661	25,225	37,886	14,219	45,377	59,596	21,950	93,425	115,375
General Aviation	11,797	26,290	38,087	12,462	28,880	41,342	12,621	29,578	42,190
Subtotal	58,524	101,616	160,140	69,472	164,239	233,711	75,930	243,445	319,375
Local Public Transit[a]	58,055	108,669	166,724	58,055	108,669	166,724	58,055	18,669	166,724
Grand Total	1,319,680	2,359,867	3,679,547	1,405,304	2,805,498	4,210,802	1,471,137	3,148,309	4,619,446

SOURCE: NTPSC forecasts.

[a] Based on estimates of expected Federal investment plans that are independent of the scenarios.

general tax revenues (Federal, state, and local) and borrowing (state and local). In 1975, of the $28.2 billion made available for highways, $18.6 billion (or 66 percent) came from imposts on highway users, $6.1 billion (22 percent) came from other taxes and fees (general and property taxes), $1.7 billion (6 percent) from investment income and other receipts, and $2 billion (8 percent) resulted from borrowing.[1]

The forecast of total revenues from 1976 through the year 2000 represented by line (A) sums to $753 billion in 1975 dollars. The sum of user imposts—line (B)—is $448 billion. Not all of these projected revenues will be available for capital expenditures. Federal transport revenues largely support capital expenditures, but state revenues are allocated as well to operations, maintenance, and repair. Figure 32 shows the decreasing percent of national expenditures (Federal, state, and local) being spent on capital investment.

States are estimated to expend $349 billion (in 1975 dollars) on maintenance and operations during the 1976 through 2000 time period. An additional $40 billion from highway revenues may be needed to pay interest on highway bonds. If the states do expend these amounts, the net revenue remaining for capital investment would be $364 billion (in 1975 dollars) based on revenue represented by line (A) of Figure 31. Such an amount falls far short of the capital investment needed to maintain current service and condition levels on the nation's highways. Further, by the year 2000, user fees would be paying only 53 percent of highway expenditures compared to 65 percent in 1975. If highway expenditures were limited to the projected highway user impost revenues (line (B) in Figure 31), there would be little or no money available for highway capital (even routine resurfacing) in the late 1990s. Table 42 contains the revenue details.

TABLE 39. Capital investment by government (millions of 1975$)

Mode	Low-Growth Scenario			Medium-Growth Scenario			High-Growth Scenario		
	1976–1985	1986–2000	Total	1976–1985	1986–2000	Total	1976–1985	1986–2000	Total
Highways	288,978	597,993	886,971	294,411	606,035	900,446	297,129	633,210	930,339
Government Autos[a]	17,938	32,121	50,059	18,133	33,081	51,214	18,276	33,591	51,867
Government Trucks[b]	11,176	17,094	28,270	13,462	28,655	42,117	14,846	37,147	51,993
Local Public Trans.[c]	58,055	108,669	166,724	58,055	108,669	166,724	58,055	108,669	166,724
School Buses[d]	1,591	2,182	3,773	1,612	2,419	4,031	1,583	2,182	3,765
Amtrak	1,900	3,000	4,900	1,900	3,000	4,900	1,900	3,000	4,900
Ports, Harbors, Facilities and Equipment[e]	8,934	15,345	24,279	10,312	19,206	29,518	10,727	22,917	33,644
Airports	11,964	15,962	27,926	13,531	21,110	34,641	14,788	24,077	38,865
Airways	2,578	4,611	7,189	2,760	5,286	8,046	2,924	5,874	8,798
Government Aircraft[f]	354	789	1,143	374	866	1,240	379	887	1,266
Total[g]	403,468	797,766	1,201,234	414,550	828,327	1,242,877	420,607	871,554	1,292,161

SOURCE: NTPSC forecasts.

[a] 2.8 percent of the total investment in automobiles is assumed to be for government vehicles (excludes military vehicles).

[b] 6.3 percent of truck investment is assumed to be government investment.

[c] May include some private transit (less than 4 percent).

[d] 87 percent of the total investment in buses is assumed to be for government expenditures.

[e] See Table 75 for detail. Includes some private investment.

[f] 3.0 percent of general aviation aircraft are assumed to be government vehicles (excludes military aircraft).

[g] Excludes any ownership in Conrail.

TABLES 38, 39 DEFINITIONS

Highways: All expenditures by Federal, state and local governments on all classifications of roads and highways.

Autos: Company-owned, government-owned, rented, and leased autos when used in business. Personal autos, motorcycles, trucks, and vans for personal transportation. Taxicabs and passenger charter services.

For-Hire Trucks: Local freight associated with goods shipped by truck within the area in or around a city or its suburbs, or within a short distance of the place where the vehicle is based. Intercity freight associated with goods shipped by truck beyond the local area.

Private Trucks: Local freight associated with private trucks within the area in or around a city or its suburbs, or a short distance from the place where the vehicle is based. Intercity freight associated with private trucks transporting persons and equipment rather than freight. All civil government trucking.

Intercity Buses: Intercity and rural bus transportation.

School Buses: All school buses (government and private). Other private buses associated with non-school, not-for-hire activities (including church, government, and business-owned).

Railroads: Intercity passenger—excluding commuter operations; freight.

Ports, Harbors and Facilities: For domestic and international marine transport. Expenditures by Federal, state, and local governments, and the private sector.

U.S. International Marine: U.S.-flag vessels in U.S. foreign trade.

Domestic Water: All domestic water freight investment associated with for-hire and private carriers (includes inland waterways, Great Lakes, and domestic ocean carriage).

Private Boats: Private inboard, outboard and other craft (sail) for personal use, recreation and other purposes. Commercial fishing boats.

Oil and Gas Pipelines: Pipelines for high-Btu gas, petroleum, and petroleum products.

Airports: All public airports and expenditures by Federal, state, and local governments, and the private sector.

Airways: Federal Aviation Administration investment for air traffic control, navigation, and flight-information services.

Domestic Air Carriers: All domestic passenger and freight investments by domestic U.S. airlines, including commuter airlines.

International Air Carriers: All international passenger and freight investment by U.S international air carriers.

General Aviation: Business aircraft not-for-hire, e.g., business-owned aircraft used for passenger or freight shipments. Aircraft for personal use. Other aircraft associated with aerial application, instructional, industrial/special, and other uses. (Includes appropriate government aircraft.)

Local Public Transit: All transit (public and privately owned) associated with local and sightseeing bus, rail transit, rail commutation and airport buses.

TABLE 40. Highway capital investment, 1976 to 1990

Market and Highway System	Capital Investment Billions of 1975 $
Urban	
Interstate	46.9
Other Freeways and Expressways	29.7
Other Principal Arterials	40.0
Minor Arterials	37.8
Collectors	15.1
Local Roads	69.1
Subtotal	238.6
Rural	
Interstate	21.0
Other Principal Arterials	36.7
Minor Arterials	41.4
Major Collectors	42.1
Minor Collectors	18.5
Local Roads	79.9
Subtotal	239.6
Total	478.2

SOURCES: "Basic" assumption for all items except local roads, U.S. Department of Transportation, *The Status of the Nation's Highways: Conditions and Performance*, September 1977, p. 167. Local roads from information prepared for U.S. Department of Transportation, *National Transportation: Trends and Choices (to the Year 2000)*, Washington, D.C.: 1977.

TABLE 41. Highway needs alternatives, 1975 to 1990 (billions of 1975 $)

Highway System	State-Reported Needs[c]	Economic Analysis Needs[c]
Local Roads		
Urban	53	53
Rural	89	89
Arterials and Collectors		
Urbanized	147	[a]127
Small Urban	28	[a]8
Rural	154	[a]4
Interstate[b]		
Local	16	16
Intercity	25	25
Total	$512	$322

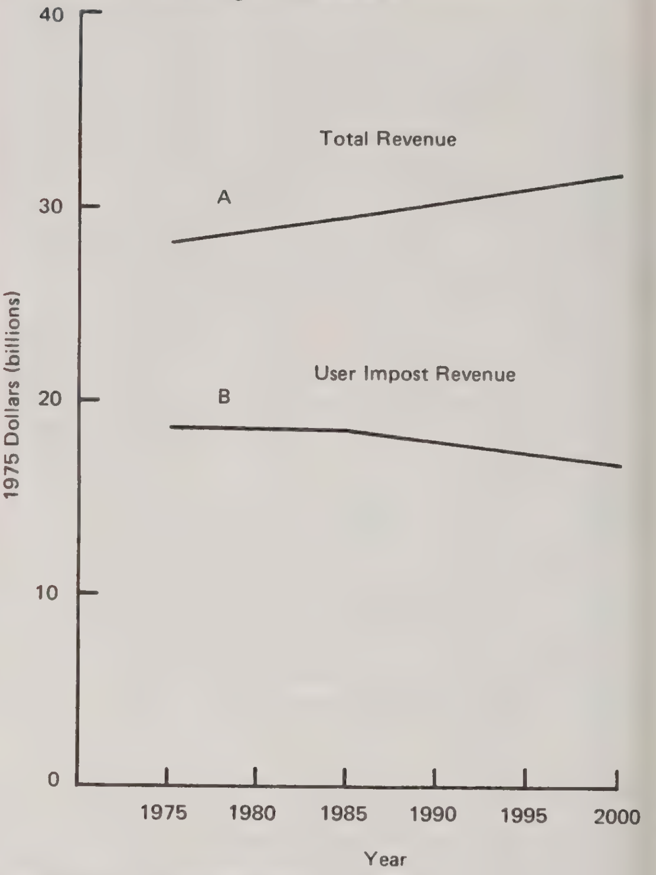
SOURCE: *1974 National Transportation Report.*

[a] *1972 National Transportation Report* estimates.

[b] *A Revised Estimate of the Cost of Completing the National System of Interstate and Defense Highways*, Committee Print, 95th Cong., 1st sess., Washington, D.C.: Government Printing Office, 1977, p. 25.

[c] The figures in both columns were modified from those reported in the sources to put them in 1975 dollars and to account for the slightly different time periods involved. This was done to facilitate comparison with the statistics in Table 40.

FIGURE 31. Forecasts of highway revenues, 1975 to 2000 medium-growth scenario.[a]



SOURCE: NTPSC estimates.

[a] GNP deflater used.

Legend:

Line B = Revenue from highway user fees and user charge taxes.

Line A = Total revenue, i.e., all of B plus general revenue and borrowing.

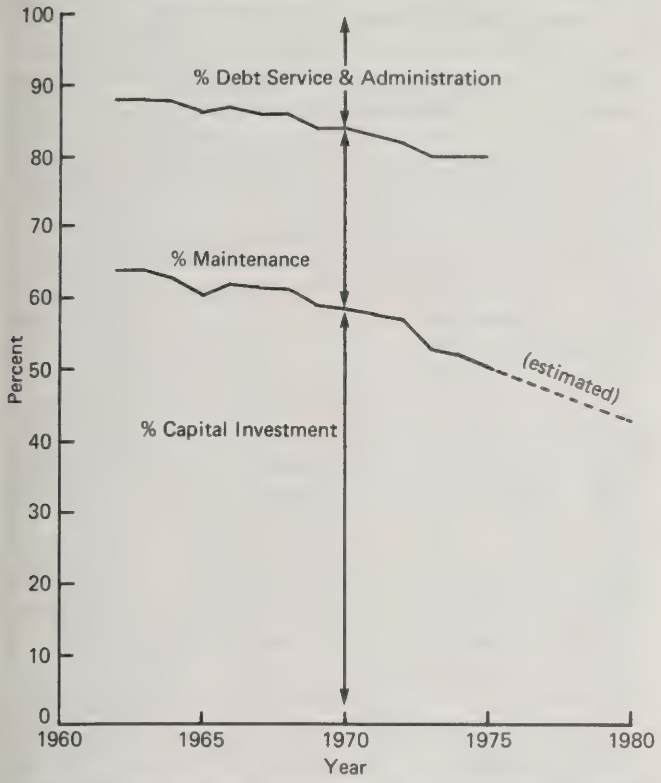
PRIVATE HIGHWAY RESOURCE NEEDS

PERSONAL VEHICLES

Highway-related investments in the auto are shown in Table 38. The definition of auto also includes vans and small trucks for personal transportation, but excludes motorcycles. The investment figure in Table 38 represents total purchases of new vehicles, with autos accounting for the preponderance. The forecast characteristics of the auto fleet yield some interesting trends as shown in Table 43.

Both the autos in use and auto sales data reflect similar patterns, with larger autos dominating the personal vehicle mode. Smaller autos are expected to lose ground to medium-size autos by 1985 and continue to do so through the year 2000. The

FIGURE 32. **Capital investment as a percent of total public expenditure for highways, 1962 to 1975 and estimate to 1980.**



SOURCE: NTPSC forecasts and U.S. Federal Highway Administration, *Highway Statistics Summary to 1975*, Washington, D.C.: Government Printing Office, 1977, Table HF 212, pp. 120–135.

TABLE 42. **NTPSC revenue forecasts, 1975 to 2000 (billions of 1975 $)**

Year	State and Local User Imposts[a]	Federal User Impost			Total User Impost	Nonuser-Tax Revenue[a]	Grand Total
		Fuel[b]	Other Fixed Rate[c]	% Rate[d]			
1975	12.9	4.0	1.0	.6	18.6	9.6	28.2
1985	13.4	3.15	.9	.9	18.4	11.3	29.7
2000	13.4	1.42	.6	1.3	16.7	15.0	31.7

SOURCE: NTPSC forecasts and U.S. Federal Highway Administration, *Highway Statistics Summary to 1975*, Washington, D.C.: Government Printing Office, 1977, Table HF 212, pp. 120–135.

[a] Projection of ten-year historical trend.

[b] Computed assuming 5% annual inflation and NTPSC fuel consumption forecasts.

[c] Computed assuming 5% annual inflation and NTPSC vehicle miles traveled forecasts.

[d] Computed using NTPSC forecasts of vehicle miles traveled.

TABLE 43. **Forecast auto fleet characteristics, medium-growth scenario, 1976, 1985 and 2000**

Auto Composition	1976	1985	2000
Autos in Use			
Small	27	19	14
Medium	18	25	19
Large	55	56	67
Auto Sales			
Small	22	16	13
Medium	27	22	19
Large	51	62	68
Avg. New Car		MPG	
Small	23	30	29
Medium	17	25	25
Large	14	21	21

SOURCE: NTPSC forecasts from Jack Faucett Associates Automobile Model.

designations in Table 43 of small, medium, or large may be misleading and confusing. The size of an auto is determined by summing seven interior measurements of each make and model.[2] Newer autos have the same measurements as those of the past, but are reduced in exterior size and weight.

Figures for average miles-per-gallon (mpg) of new autos may change from those of Table 43, because the DOT Secretary has the legal authority to alter the regulated mpg standard. By 1986, however, average new auto mpg must be 27.5.[3]

Table 44 illustrates auto sales, scrappage, and fleet sizes. In the medium-growth scenario, the gap between auto sales and scrappage is projected to decrease by the year 2000. Auto fleet size, as forecast in that scenario, is to increase by 24.9 million by 2000. The average annual increase between 1976 to 1985 is 1.6 million, while between 1986 and 2000 the increase is 591 thousand. These figures are influenced by changing auto demand, demographic characteristics, and energy costs.

Table 45 demonstrates estimates of average vehicle prices, by size class, in constant 1975 dollars for all three scenarios, multiplied by the auto sales mix. This calculation yields an overall average vehicle price. These projections represent only that part of the assumed increase in the real price of automobiles which reflects the cost of meeting environmental, energy, and safety standards imposed by Federal and state governments.

TRUCKING

Table 46 presents capital requirements of the for-hire and private trucking industries. Included within the

TABLE 44. Auto sales, scrappage, and fleet size, by scenario, 1976, 1985 and 2000 (thousands)

		1976	1985	2000
Low-Growth Scenario	Sales	12,256	9,557	10,631
	Scrappage	8,078	9,852	9,881
	Net	4,178	–295	750
Medium-Growth Scenario	Sales	12,256	11,029	11,757
	Scrappage	8,078	10,278	11,191
	Net	4,178	751	566
High-Growth Scenario	Sales	12,256	11,858	12,313
	Scrappage	8,078	10,947	11,910
	Net	4,178	911	403
Auto Fleet Size				
Low-Growth		112,600	116,394	126,052
Medium-Growth		112,600	128,719	137,586
High-Growth		112,600	134,614	142,670

SOURCE: NTPSC estimates using Jack Faucett Associates Auto Model. Auto fleet size forecasts were based on higher travel estimates by the NTPSC. The fleet estimates differ somewhat from similar statistics in Chapter 9 due to differences in the method of forecasting.

category of private trucking are both intercity and local segments. The table also shows the investment allocated for replacement and growth of the present stock. For lack of data, no estimates are given for the investment private trucking is expected to make in terminals and other structures or facilities.

In financing equipment needs, for-hire carriers draw on both internal and external sources of capital. Equipment manufacturers have long provided vendor credit arrangements, either directly or through affiliated finance companies. For many years, commercial banks evidenced little interest in trucking finance. They now participate tentatively, but generally insist on a close relationship between the cash flow generated by the equipment and debt amortization. Carriers may also lease equipment from commercial leasing companies or from owner-operators. Many regulated carriers, particularly those that handle special commodities, rely heavily upon owner-operators, thereby reducing their own capital needs.

The equipment financing needs of owner-operators deserve particular mention. New entrants may have difficulty obtaining bank support and, consequently, turn to equipment manufacturers for financing. In some instances, owner-operators participate in fleet purchase plans offered by regulated carriers.

Terminal and real estate financing varies in importance depending on the sector of the trucking industry in which a company operates. One example is the exempt owner-operator specializing in truckload movements solicited directly or obtained through a broker or carrier. In these circumstances, terminal and real estate needs are modest. Another example is the large carrier of general commodities whose business consists mainly of less-than-truckload traffic. Effective solicitation and handling of this traffic requires large investments in consolidation and break-bulk facilities, necessitating considerably more capital than for other motor carriage. In addition to equity sources, larger carriers have come to rely increasingly upon insurance company mortgage loans with 15 to 20 years maturity for terminal and real estate financing. In some instances, insurance companies have established sale-leaseback arrangements with motor carriers. Commercial banks have participated to some extent in terminal and real estate financing but generally prefer loans having shorter maturities.[4]

Only a few firms in trucking are subject to the reporting requirements of the ICC, thus limiting the data base and making it difficult to obtain an accurate picture of the industry's financial condition. Some observations may be made, nevertheless.

Motor carrier earnings are somewhat cyclical and subject to fluctuation. In some years, however, ICC-regulated carriers have earned an annual return on equity considerably above that of U.S. industry in general.[5] Responding to this differential, and the regulatory reform movement, the ICC has decided that the return on equity of regulated motor carriers should not exceed that earned by all manufacturing;[6]

TABLE 45. Forecast auto sales mix and average new car price, 1976, 1985 and 2000 (1975 $)[a]

	1976			1985			2000		
	Price ×	Fraction =		Price ×	Fraction =		Price ×	Fraction =	
Small	3,274 ×	.217 =	710	3,969 ×	.163 =	647	4,278 ×	.133 =	569
Medium	3,927 ×	.276 =	1,084	4,974 ×	.219 =	1,089	5,255 ×	.187 =	983
Large	5,097 ×	.507 =	2,584	6,528 ×	.618 =	4,034	6,807 ×	.680 =	4,629
Average Price			4,378			5,770			6,181

SOURCE: NTPSC estimates from Jack Faucett Associates Automobile Model. This model estimates real dollar cost increases in automobiles due to environmental, safety and energy regulation.

[a] Forecast the same for all scenarios.

with this decision the ICC effectively concluded that the risk associated with regulated trucking is no greater than that incurred by manufacturing. Regulated carriers contend this action will reduce their access to capital.

TABLE 46. Forecast capital investment for trucking, by scenario, 1976 to 2000 (millions 1975 $)

	Facilities		Equipment		
	Expansion	Replacement	Expansion	Replacement	Total
For-Hire Trucking					
Low-Growth Scenario					
1976–1985 ...	383	1,225	550	25,561	27,719
1986–2000 ...	247	2,048	690	42,454	45,439
Total	630	3,273	1,240	68,015	73,158
Medium-Growth Scenario					
1976–1985 ...	1,462	1,317	4,014	27,465	34,258
1986–2000 ...	3,664	2,762	11,595	57,228	75,249
Total	5,126	4,079	15,609	84,693	109,507
High-Growth Scenario					
1976–1985 ...	1,602	1,328	4,461	27,706	35,097
1986–2000 ...	6,219	3,102	19,753	64,293	93,367
Total	7,821	4,430	24,214	91,999	128,464
Private Trucking (Intercity and Local)					
Low-Growth Scenario					
1976–1985 ...			48,100	101,581	149,681
1986–2000 ...			32,590	193,312	225,902
Total			80,690	294,893	375,583
Medium-Growth Scenario					
1976–1985 ...			70,686	108,742	179,428
1986–2000 ...			121,971	257,629	379,600
Total			192,657	366,371	559,028
High-Growth Scenario					
1976–1985 ...			86,821	113,745	200,566
1986–2000 ...			191,669	304,591	496,260
Total			278,490	418,336	696,826

SOURCE: Estimates made for the NTPSC by Jack Faucett Associates, 1978. Based on the use of two techniques. Replacement values were computed using continuing inventory accounting techniques. Expansion values were based on projections of historical trends in capital to output ratios. According to communication from Jack Faucett Associates:

> "The capital investment and stocks data represent all trucks except personal trucks and those held by commercial carriers. Thus the data considerably overstate capital used strictly for transportation purposes.
>
> "There are no consistent measures of output for these trucks over time since estimates must be compiled from incomplete data and are subject to considerable error. Output data for two points, 1972 and 1975, were compiled and were used to calculate and project the capital/output ratio. The projected ratio was applied to projected ton-miles for intercity freight carried by private truck; since the capital investment and stocks series include a much larger universe, the projections are subject to considerable error."

While the financial condition of the motor carrier industry has generally improved over the past several years, some problems exist. Carriers in the New England region have experienced continuing financial difficulties. Several major bankruptcies have occurred. The financial problems which reportedly plague the independent operators could force many out of business.[7]

For-hire trucking also faces escalating costs of insurance, equipment, and fuel. New wage contracts could also raise costs substantially. Proposed change in the structure of trucking regulation has caused uncertainty in the financial community and could impair the industry's access to capital, at least in the short run.

Employment in for-hire motor carriage is predicted to rise as traffic grows. However, a recent study by the Bureau of Labor Statistics (BLS) predicts differing growth rates for the categories of long-distance and local truck driving. The BLS forecast indicates that the employment of long-distance truck drivers will increase more slowly than the average for all occupations through the 1980s.[8] Their forecast was strongly influenced by an assumption that larger vehicles will be permitted to operate. The BLS expects local truck-driving employment to increase faster than the average for all occupations through the mid-1980s.[9] The BLS assumed that local driving employment would be unaffected by the larger intercity trucks, and that local delivery of the increased aggregate volume of traffic would require more local drivers. Projections of employment in for-hire trucking are presented in Appendix Table 46.

Many shippers have instituted private trucking operations. One measure of the extent to which shippers are committed to private trucking was provided by a DOT survey of large shippers in Standard Metropolitan Statistical Areas. Forty-nine percent of those responding indicated that a portion of their traffic moved via private carriage. The average respondent transported 27 percent of their total traffic by private carriage.[10]

While many private trucking operations (such as the delivery operations of local dairies or department stores) are of limited scope, much private trucking engages in interstate operations.[11] In many instances, firms which have moved into private carriage still use common carriers, particularly to meet peak demand.[12]

Historically the ICC attempted to prevent private carriers from expanding into for-hire operations which would infringe upon the markets of regulated carriers.[13] However, it has expressed the intention of making it easier for private carriers to engage in back-haul for-hire services.[14] In the short run, this should serve to increase the attractiveness of private carriage, at the expense of common and contract carriers.

In attempting to assess the ability of private trucking to attract capital, it must be understood that such operations are normally treated as part of the traditional corporate capital budgeting process. Potential investments in private trucking must be weighed against other corporate alternatives. As such, firms are likely to scrutinize projected return on investments in such operations very closely. Final corporate capital allocations will therefore be a function, not only of these potential returns, but of the financial condition of U.S. industry in general.

INTERCITY BUS

Intercity bus traffic has remained relatively stagnant at roughly 25 billion passenger miles since 1970, although the energy problems of 1974 and 1979 led to at least temporary ridership increases. A partial off-set has been the expansion of package express and charter services, but the annual return on equity realized by Class I carriers declined steadily from 16.1 percent in 1971 to 8.3 percent in 1976.[15] Frequency of service along unprofitable routes is gradually being reduced or routes abandoned.

The capital needs of the intercity bus industry, as projected, are shown in Table 47. As indicated, investment requirements will be substantially greater for equipment than for structures (including terminals), a trend consistent with recent experience. During 1976, for example, Class I intercity bus operators reported that 78.6 percent of investment funds were spent for fleet expansion and replacement.[16] Further, prices for new buses have doubled over the past decade.[17]

Prospects are not particularly promising for the intercity bus industry, unless fuel availability problems induce shifts from the automobile. Operators have faced strong competition from private automobiles (and in some corridors Amtrak) and from airlines for trips over 200 miles. The industry's modal share of intercity passenger miles declined from 2.1 percent to 1.8 percent during the seventies.[18] Competition, passenger profiles, and to some extent regulation have effectively limited the industry's ability to defray cost increases through the farebox. The declining return on equity raises doubts as to its ability to generate capital from internal sources.

The intercity bus industry has strongly protested continued subsidy of Amtrak and has asked the ICC to allow it greater flexibility in price setting.[19] Just how such changes might affect the industry is unclear. The bus industry has been seeking Federal subsidies to offset the inequity it perceives in the government's funding of Amtrak. Like Amtrak, the bus industry might cite such social benefits as energy conservation, environmental protection, and safety in support of its call for subsidy. Federal subsidies for the intercity bus industry were authorized by the Surface Transportation Assistance Act of 1978 (Pub. L. 95-599), though none were actually appropriated as of June 1979. The statute permits grants for terminal development and service improvement. The program expires in 1982. The states of New York, New Jersey, Michigan, and Pennsylvania currently subsidize intercity bus operations.[20]

Intercity bus employment is projected to rise steadily as traffic increases over the forecast period. The projections appear in Appendix Table 47. Labor productivity in passenger miles of travel per employee, shown in Table 48, is forecast to be rather stable. Productivity is influenced by the 55 miles-per-hour speed limit, the limited seating capacity of individual buses, and a lack of technical improvement in bus equipment.

TABLE 47. Forecast intercity bus capital investment, by scenario, 1976 to 2000 (millions of 1975 $)

	Facilities		Equipment		
	Expansion	Replacement	Expansion	Replacement	Total
Low-Growth Scenario					
1976–1985 ...	33	67	107	461	668
1986–2000 ...	71	102	163	683	1,019
Total	104	169	270	1,144	1,687
Medium-Growth Scenario					
1976–1985 ...	73	73	195	472	813
1986–2000 ...	129	116	271	774	1,290
Total	202	189	466	1,246	2,103
High-Growth Scenario					
1976–1985 ...	106	77	268	508	959
1986–2000 ...	140	126	322	810	1,398
Total	246	203	590	1,318	2,357

SOURCE: NTPSC estimates.

TABLE 48. Forecast intercity bus labor productivity for Class I, II, and III carriers, medium-growth scenario, 1975, 1985 and 2000

Year	PMT (10^9)	Employment (1000)	Productivity
1975	25400	46.7	543.8
1985	27000	50.9	530.5
2000	31000	56.9	544.8

SOURCE: NTPSC forecasts.

Capital needs of school buses were shown as a separate line item in Tables 38 and 39. The school bus estimates were based on forecasts of the future school age population and a constant ratio of buses to students.

RAILROADS

Railroad facilities (including rolling stock and rights-of-way) are supplied for the most part by private companies. U.S. policy is to maintain a privately-owned railroad system and limit Federal capital assistance to railroads in financial difficulty. Except for pipelines, railroads is the only mode that provides and maintains its own right-of-way. While ownership of the infrastructure has certain advantages, it results in state and local taxation, and the burden of large maintenance and rehabilitation expenditures.

CAPITAL REQUIREMENTS

A recent study by the ICC's Bureau of Economics, as part of Ex Parte 271, projected $27.8 billion in equipment capital needs for railroads over the 1976 to 1985 decade.[21] Another estimate of railroad capital requirements over the near future is provided by a recent DOT study. The DOT estimates for the period 1976 to 1986 were as follows:[22]

Capital Expenditures	Billions of Dollars
For road property	6.8
For equipment	21.5
To repay debt coming due	10.7
To improve working capital and for other uses	3.5
Total	42.5

These estimates exclude Conrail, the Long Island, and Amtrak (which together account for 13 percent of the car miles in the industry).[23] Of greater interest than the absolute estimates of investment expenditures are the forecasts of the gap between the flow of funds available for capital outlays and the amounts necessary to maintain the integrity of the railroad plant.

The ICC projects a cash shortfall of nearly $3.6 billion over the 1974 to 1982 period.[24] However, the estimating procedure used by the ICC did not take complete account of fixed charges. A 1975 study by First National City Bank of New York (FNCB) attempted to recalculate the capital shortfall using the results of econometric models. The FNCB analysis developed an estimated deficit of $21.1 billion over the 1976 to 1985 decade.[25] The FNCB projection tends to exaggerate the potential shortfall because it assumes that the railroads can borrow to meet the deficit incurred in any given year (and includes the interest in future years' deficits) and that equipment debt financing will not be available. In the same year, Harbridge House, Inc., reestimated the FNCB model and developed an estimate of the shortfall ranging between $5 and $12 billion depending on the availability of equipment debt financing.[26]

The ICC and FNCB projections of the railroad capital requirements deficit predate President Carter's energy proposal, which calls for increased reliance on coal to meet the nation's long-term energy needs. Much of this coal would come from the western states and presumably would be hauled by rail. If the railroads are called upon to carry this additional traffic, capital requirements will rise dramatically. Although the industry foresees little difficulty in acquiring the 9,700 to 13,400 new coal cars per year needed to meet the challenge, funding of regional plant and facility improvements will likely be more difficult.[27]

Table 49 shows forecasts of rail capital requirements from 1976 through 2000 for each of the three NTPSC scenarios. These were derived in a different way from those of the previously mentioned studies and, for comparable time periods, are generally greater than those previously reported. A major factor explaining the difference lies in coal production and transport. The figures in Table 49 assume

TABLE 49. Forecast railroad capital investment requirements (millions of 1975 $)

	Facilities		Equipment		
Period	Expansion	Replacement	Expansion	Replacement	Total
Low-Growth Scenario					
1976–1985 ...	7,614	16,584	6,369	21,602	52,169
1986–2000 ...	922	27,562	574	35,500	64,558
Total	8,536	44,146	6,943	57,102	116,727
Medium-Growth Scenario					
1976–1985 ...	17,521	18,172	16,620	23,664	75,977
1986–2000 ...	31,577	39,666	32,004	51,080	154,327
Total	49,098	57,838	48,624	74,744	230,304
High-Growth Scenario					
1976–1985 ...	26,967	19,624	26,375	25,547	98,513
1986–2000 ...	55,056	49,492	56,062	63,726	224,336
Total	82,023	69,116	82,437	89,273	322,849

SOURCE: Estimates made by Jack Faucett Associates for the NTPSC. Replacement was estimated based on continuing inventory accounting. Expansion was based on a projection of historical trend in capital-to-output ratios applied to the forecast outputs.

increases in rail traffic resulting from implementation of the nation's energy plans.

Railroad earnings have long been poor. Rates of return on investment have not surpassed 3 percent in more than a decade and have been below 2 percent since 1975.[28] Even if only the capital invested in the previous decade is included, annual rates of return are much below those earned in industries of comparable risk.[29]

Current railroad profitability is not adequate to support required capital investment. For the first six months of 1978 average railroad net operating income was only 0.9 percent of net investment.[30] This return is far below both the cost of capital to the industry and the return available in other industries. It will be hard to avoid disinvestment if current rates of return continue. Much of the recent investment appears to have been either that required to stay in business (the replacement of locomotives and cars), investment needed to support new business believed to be highly profitable (specialized cars and sidings), or investment needed to take advantage of major technological changes that have a high return (new signal systems or hump yards).

Despite worsened financial condition of the industry in general, many carriers have continued to pay relatively high dividends. Dividend yield is a major determinant of common stock price in the absence of high earnings or future growth potential. If earnings are stagnant or decline, investors will be unlikely to hold the stock unless the dividend yield offsets the unsatisfactory earnings performance. In this way, the securities markets encourage the liquidation of declining industries.

Despite low returns in the early post-World War II era, the railroads were able to generate internally a majority of the funds required to meet capital needs.[31] However, since the mid-fifties railroads have had to rely increasingly on external sources.[32] Insurance companies historically provided long-term loans to railroads, but as the industry's economic situation deteriorated, the insurance companies reduced the number of railroad obligations in their portfolios.

Low rates of return forced railroads to rely on more debt financing, which increased capital costs and further reduced profits.[33] This contributed to additional cutbacks in capital expenditure and maintenance and was a factor in the erosion of rail's competitive position.

Thus, the railroads are not in a strong position to raise capital through equity sales or borrowing, and internal cash generation falls far short of meeting the industry's requirements. The railroads have been able to finance new rolling stock and locomotive acquisition through equipment trust certificates and leasing, but have had greater difficulty in providing capital to meet other needs.[34]

Issuance of equipment trust certificates has provided lenders with a high level of security for their investment. The equipment trusts usually require a 20-percent downpayment and a 15-year payout. As the average useful life of rail rolling stock is closer to 30 years, the market value of the instrument is greater than the indebtedness from the day of issue. If a railroad defaults on its payments, the equipment can be repossessed and sold to another railroad. Thus, there is little risk and a low risk premium. Holders of equipment trust certificates possess claims senior to those of bondholders and stockholders with respect to the assets financed.

The railroads have also engaged in equipment leasing. Lessors are in a senior position to investors holding equipment trusts. Both sources of funds for equipment acquisition have been made available to the railroads at favorable interest rates. However, when railroads substitute equipment debt for funded debt and equity, they make future reorganization of bankrupt carriers more difficult. Past reorganizations have succeeded by changing the firm's capital structure so as to reduce capital costs to the point where operating revenues can cover them. But equipment debt cannot be voided. Lessors can exercise their right to repossess the equipment. For the industry as a whole, avoidable capital costs have declined from 18.5 percent of total operating costs in 1935 to only 3 percent in 1970.[35] This severely restricts the ability of bankruptcy courts to salvage a system through reorganization of the debt structure.

On the other hand, the ability to finance equipment through equipment trusts and leasing at reasonable cost has provided the railroads the opportunity to use internally generated funds to finance property improvements. In some instances, however, internal funds have either not been so dedicated, or have not been sufficient to adequately maintain the fixed plant.

A special set of problems relates to car supply. A major determinant of railroad capital requirements is car utilization. The number of cars required is the number of car loads divided by the number of trips per year. In 1977 the average car required 26.1 days for a round trip.[36] This is a high figure, and due partly to the lengthy periods cars are idle in either railroad or customer hands. A second reason is that most cars return empty after unloading (only 55 percent of car miles are loaded).[37] In addition, lack of adequate funds has caused some railroads to delay or not repair equipment when it becomes unusable. Any improvements in car utilization would substantially reduce the number of cars required and the investment needed to purchase them.

FEDERAL FINANCIAL AID

Current policy places heavy reliance on private capital markets for railroad financing, but makes Federal financial aid available, primarily for railroads in financial difficulty.

The Federal government, while tending to resist direct cash subsidies, has aided railroads by other means, such as loans or loan guarantees.[38] Loans, repaid, might not be considered subsidies, but to the extent that government money is loaned at an interest rate below the normal industrial borrowing rate, competing modes would contend that, in fact, those loans constituted a subsidy. Defaults of such loans would likewise be considered subsidies. The NTPSC, however, assumed, for the purpose of the following discussion, that if there is no cost to the general taxpayer, then there is no subsidy.

In the past decade, the outstanding level of rail loans appears to have been as high as $500 million. Some loans have been repaid; for some (at least $222 million in Conrail's case) the obligation to repay has been voided, and some are expected to be repaid.[39]

Most Federal assistance in recent years has gone to eastern and midwestern railroads. The most extensive effort involved the creation of Conrail. Payment to the owners of the bankrupt properties taken over by Conrail was in the form of preferred and common stocks, plus some federally guaranteed "certificates of value" issued by the United States Railroad Association (USRA), a Federal agency set up to plan for and monitor Conrail. The value of the transferred properties is being adjudicated by a special Federal court established for this purpose. The Federal government has obligated itself to redeem the certificates of value by paying the difference to the bankrupt railroad estates with interest accumulated from April 1976 (the date of conveyance).[40]

The Railroad Revitalization and Regulatory Reform Act of 1976 (4R Act)[41] provided Conrail with $2.1 billion in long-term financial assistance, one billion for Federal purchase of Conrail debentures (at 7.5 percent interest) and $1.1 billion for Conrail preferred stock (at 7.5 percent in cumulative dividends). In late 1978, Congress authorized Federal purchase of another $1.2 billion in preferred stock, bringing the Federal investment in Conrail to $3.3 billion.[42] The provisions for redemption and payment of dividends or interest on the Federal government holdings can be modified by a committee consisting of the Chairman of the USRA and the Secretaries of Transportation and the Treasury with authority to "waive compliance with any term, condition, provision, or covenant" of Conrail securities held by the Federal government.[43]

Conrail has run a deficit each year since its inception. In 1977, the deficit was $367 or $631 million depending on the method of accounting used. For 1978 the respective figures were $480 or $700 million.[44] The General Accounting Office (GAO) estimated that Conrail may need another $2.5 billion to carry it through 1982. GAO also pointed out that the funding of statutory railroad retirement and employee protection might increase the need for Federal funds by another $680 million between 1977 and 1982.[45] Assuming a long-term investment rate of 9 percent as compared to the 7.5 percent figures mentioned above for the debentures and shares, the alleged interest subsidy on the $3.3 billion level of Federal involvement amounts to about $49.5 million per year (if the Conrail obligations are fully repaid). If Conrail's financial health should decline, the Federal government would become a part owner of the rail properties.

The Federal obligation to pay for the rail properties transferred to Conrail must also be considered. The Federal government must pay the adjudicated difference in value between the properties transferred to Conrail and the common or preferred stock awarded in exchange. This might amount to billions of dollars.

In addition, there are several other items which apply more broadly to railroads. Section 505 of the 4R Act authorized $600 million for the government purchase of redeemable preference shares to finance rail projects.[46] The Powerplant and Industrial Fuel Use Act of 1978[47] added another $100 million for projects involving rail transportation of coal. The preference shares may include preferred stock of solvent railroads and also trustee certificates of bankrupt railroads. The payments work out to an effective rate of 4.2 percent over the 20-year span. Figured over the 30-year period as a whole, the effective rate is 2 percent. Using an assumed 9 percent cost of government borrowing yields a net railroad benefit per year of $49 million, if all is spent.

Section 511 of the 4R Act authorized a $1 billion Federal program of loan guarantees for the acquisition, rehabilitation, or improvement of rail facilities or equipment.[48] As of September 30, 1978, applications totaling $690 million had been received and guarantees totaling about $100 million had been approved.[49] Federal guarantees not only increase the ability of the recipient railroads to float loans, they are also likely to decrease the interest rates at which the bonds would sell. The probable value of properties to be improved, rehabilitated, or acquired must be such as to provide the U.S. with reasonable security in the event of default. This condition may be difficult to satisfy for some projects that are in the public interest but are of too little market value to provide adequate security. The railroad accepting the guarantee must agree to DOT approval of dividend terms and conditions that restrict dividend payments and the diversion of railroad assets or earnings to non-railroad purpose.[50]

In addition to the foregoing, the 4R Act authorized an expenditure of $1.6 billion for upgrading the Northeast Corridor rail system.[51] In 1979 this sum may be increased to $2.4 billion as a result of administration proposals. The primary objective of corridor authorizations is the improvement of rail passenger service.

RAIL PASSENGER SERVICE

Although the capital formation problems which beset the nation's freight-hauling railroads are of overriding concern, rail passenger operations will also require capital if the traveling public is to continue to have a third alternative to the dominant air and highway modes.

The preponderance of intercity rail passenger service is operated by Amtrak, a quasi-public, government-sponsored corporation that in 1971 was assigned the task of revitalizing a then fast-fading feature of the nation's transportation landscape.[52]

NTPSC's medium-growth scenario projects an increase in rail ridership of roughly 14 percent between 1975 and 2000. This estimate is the smallest of those projected for the intercity passenger modes. The NTPSC forecast is a "status quo" projection in terms of policy. Yet, this may be inappropriate in the case of intercity rail passenger operations should short-run energy shortage conditions worsen. Further, the Federal government is currently in the midst of a program designed to stimulate substantial Amtrak travel in the Northeast Corridor (NEC). Congress has allocated $1.75 billion to upgrade the NEC to allow high-speed rail passenger train services.[53] The NEC presently generates 60 percent of Amtrak's ridership.[54]

Nearly all Amtrak capital comes from the Federal government. Amtrak operates at an overall loss that actually exceeds system revenues. The Corporation's original legal identification as a "for-profit" corporation has now been modified in recognition of its financial condition. Thus, Amtrak must rely on capital grants to upgrade and improve the rail plant. Outside the NEC, Amtrak operates over trackage owned by the freight-hauling railroads. Only in the NEC does Amtrak own the right-of-way. Thus, its basic capital needs are for rolling stock.

In its 1978 to 1982 five-year plan, Amtrak estimates slightly over $1 billion (in constant dollars) will be required for capital acquisitions.[55] Nearly two-thirds of this amount will be used to purchase locomotives and rolling stock.[56] The Corporation projected a 38 percent increase in ridership over this period.[57]

The elements of Amtrak's five-year plan were produced prior to a report by the U.S. DOT recommending that the Amtrak system be reduced in size. According to the DOT report, the operating support required by Amtrak in the 1980 to 1984 period would drop from $4.087 billion to $3.009 billion with only a 9 percent decrease in ridership. The DOT estimates capital requirements would decrease in current dollars, by $313 million in the same period.[58] These capital estimates, even after system reductions, are higher than the 1978 to 1982 Amtrak estimates, because they include NEC purchase costs plus labor protection payments, and are expressed in current dollars.

The joint DOT-Amtrak passenger-mile forecasts for the period indicate that growth in the new recommended system would be approximately 1.0 percent per year, whereas it was forecast to be approximately 0.5 percent per year if the current system was retained. (The DOT-recommended system is to be deemed approved unless either House of Congress adopts a resolution of disapproval within 90 calendar days of continuous session.)

Amtrak's projections of capital requirements are not devised primarily from ridership forecasts, but, rather, represent the Corporation's determination of what improvements are necessary to rehabilitate intercity rail passenger service. This process has continued since 1971. At that time, Amtrak inherited a seriously debilitated system. Nearly all passenger cars and locomotives were more than 20 years old; passenger stations, terminal conditions, and many other elements of the passenger service infrastructure were in a serious state of disrepair.[59] Amtrak has attempted to correct the situation and to modernize service. Thus, capital needs were particularly heavy in the early years but should be expected to stabilize.

It is unlikely that subsequent five-year periods will have needs greater than the $1 billion requested by Amtrak for 1978 to 1982, particularly if the DOT's recommendations are adopted. Thus, Amtrak capital requirements should be less than $4 billion (in constant dollars) through the year 2000, exclusive of federally funded work in the NEC, purchase of the NEC, and any labor protection costs if the system is cut as proposed by DOT.

RAILROAD EMPLOYMENT

The employment-to-output ratio for the rail industry is expected to continue improving over the forecast period, although at a rate considerably below that of the past two decades. The railroads have achieved a continuous reduction in work force, from 1,326,000 employees in 1947 to less than 500,000 today.[60]

Despite this large reduction, the total railroad wage bill has risen.[61]

An important source of increased productivity has been the trend toward larger cars and longer trains. The average weight of a carload of freight increased from 35.4 tons in 1929 to 61.1 tons in 1977.[62] A train of larger or heavier cars can be handled by approximately the same size crew, and longer trains can be handled by relatively less labor per car than shorter ones. Productivity increases have also resulted from important technological developments such as dieselization, mechanization of the maintenance-of-way function, automated classification yards, computers, and centralized traffic control. Further, some of the improvement in private-sector rail labor productivity traces to the virtual cessation of activities which were the most labor-intensive (i.e., passenger train services and less-than-carload freight).[63] These trends are reflected in Appendix Table 48 employment projections.

Railroad employees have made substantial gains in purchasing power. From 1967 to 1976 the average wage in the industry rose 112 percent[64] compared to a 70 percent rise in the Consumer Price Index.[65] Wages in manufacturing, contract construction, and wholesale and retail trades climbed 81 percent, 85 percent and 62 percent respectively.[66] By 1976 the average annual non-supervisory wage in the railroad industry was $17,180 compared to $11,600 for the total of private, non-agricultural employment.[67]

Amtrak projects that labor productivity will exhibit significant improvement over the next five years.[68] It would appear that there will be little change in the absolute level of employment in rail passenger service over the 1975 to 2000 period if the current system is retained..

PIPELINES

OIL PIPELINES

There are 440,000 miles of major intercity oil pipelines in the U.S. Crude oil pipelines run from producing areas and ports to the major refining centers. Refined product lines carry gasoline, heating oil and other products from refining centers to major consuming markets. Major anticipated projects include pipelines to deliver Alaskan crude oil to the Midwest from the West Coast and hookups with sources of synthetic fuel production and off-shore oil facilities. Otherwise, significant expansion is not expected.[69]

U.S. oil consumption has been growing slowly, but non-Alaskan production is stagnant. It is expected that further growth in the U.S. economy will not induce significant expansion of new crude pipelines. As new fields are discovered, short lines will be required to tie them into the existing pipeline network, or to move crude oil to suitable locations for refining or further transportation. Most such projects are likely to be in established producing areas and are expected to be completely financed by private industry. It is probable that new off-shore discoveries will require expensive lines to connect them to shore. Some areas of Alaska, such as the National Petroleum Reserve, could yield discoveries on-shore, requiring substantial investments in pipelines to ocean ports. While the location and cost of any lines required by new Atlantic offshore or Alaskan discoveries are unknown, it is likely they can be financed by the large firms in the industry. The Trans-Alaskan pipeline can be cited as a successful precedent.

Further growth of the American economy will call for relatively slow increases in interregional crude pipelines. Because of increasing U.S. dependence upon imported crude, new refinery capacity typically will be proximate to ocean ports.

Two Gulf Coast deepwater ports designed to handle imported crude have been proposed. One—the Louisiana Offshore Oil Port (LOOP)—is under construction. The other is being licensed by the Texas Deepwater Port Authority. LOOP would cost in the range of $1 billion.[70] An eventual need might materialize for additional pipeline capacity between these ports and the Midwest. These requirements would probably be met by expanding existing capacity.

Requirements for additional investments could arise from a decline in crude deliveries from Canada, and the "surplus" of crude on the West Coast. The Canadian government has announced its intention to phase out most crude deliveries to U.S. refineries which have traditionally used Canadian crude.[71] These are the so-called "northern tier refineries," many of which lack alternative sources. At the same time, a surplus of high-sulphur Alaskan crude oil has been accumulating on the West Coast because of the inability of many local refineries to process it and California anti-pollution laws requiring the use of low-sulphur oil.[72]

These circumstances have led to proposals for pipelines from the West Coast. One calls for a line from Puget Sound to the upper Midwest, serving northern tier refineries in route;[73] another would run from British Columbia.[74] The Northwest Pipeline Company has proposed a line from Skagway, Alaska.[75] Still another plan would utilize the existing Trans-Mountain pipeline.[76] Any of these proposed pipelines would move Alaskan crude and low-sulphur, imported crude to new northern tier refineries.[77] Each project could cost up to $1 billion.[78]

If the lack of petroleum for northern tier refineries was the only problem, it probably could be solved by relatively low-cost investment schemes. Refineries on Puget Sound can easily receive crude by water. Michigan, Wisconsin and Minnesota can be supplied from the Gulf Coast. Low-cost alternatives could supply U.S. crude to Montana and North Dakota via pipelines from other parts of Montana and Wyoming or unit trains of tank cars. The lowest-cost alternative would be an arrangement with Canada, for U.S. crude to be provided to Eastern provinces in exchange for continued supplies of Canadian oil.[79]

The West Coast surplus has been a problem because of U.S. prohibitions on exports of Alaskan crude. Calculations show that the minimum-cost solution involves exchanges by which Alaskan crude would be replaced with crude purchased abroad and delivered to the East Coast.[80] This option has been tentatively rejected for both security and political reasons, but remains under study.[81]

However, the U.S. is committed by the International Energy Agreement to share the available oil supply in the event of embargo. The share is determined by a formula based on net imports.[82]

Should the large-scale synthetic fuels production forecast in Chapter 8 materialize, pipelines will be required from oil shale or coal plants. If there is a surplus of oil on the West Coast, such lines would run eastward to major deficit markets in the Midwest. Pipeline costs should be small in relation to costs of the synthetic fuel projects, and the pipelines could be financed by obtaining commitments for their use from the synthetic fuel owners. Studies suggest that pipelines are cheaper than ships (via the Panama Canal) for the movement of oil from the West Coast to the East.[83]

Financing any of these pipelines is probably feasible, but could present problems. Traditionally, pipelines have been financed by the agreement of customers (major oil companies) to use them enough to recover investment costs. With assured usage, debt financing can be employed. Still, some of these proposals might run into problems. West-to-East movements of oil make sense only so long as Federal regulations forbid international oil exchanges and West Coast refineries are not modified to use Alaskan and California crude. Over the 20 or more years that a pipeline would be in use, export restrictions could be changed, the surplus might be reduced by normal growth, or refineries could be modified. Consequently, refining companies might be reluctant to commit themselves to paying the high cost of a pipeline. Without commitments, some projects may encounter financing difficulties.

Major, new, refined product lines are not anticipated chiefly because improved fuel efficiency for autos is expected to result in little increase in the volume of gasoline to be transported. Any additional investment that might be necessary will be used to expand existing lines. Owners of existing lines should be able to finance these expansions using traditional methods.

Table 38 shows anticipated oil pipeline capital investments.

NATURAL GAS PIPELINES

The gas pipeline network totals 255,000 miles,[84] most of it radiating from the producing areas in the Southwest to markets elsewhere. With the exception of projects to facilitate the importation of foreign gas or movement of Alaskan gas, major new projects are not anticipated. As existing fields are gradually depleted, considerable excess capacity develops in many of the lines from the mid-continent and the Gulf Coast producing areas to major markets. Marketed production of natural gas declined from 22,532 trillion cubic feet in 1972 to an estimated 19,952 trillion cubic feet for 1976.[85] While some recovery in production levels is possible, increases in domestic production sufficient to require construction of major new, interregional pipelines are not anticipated other than for Alaskan gas. Any imports of Mexican gas are expected to be fed into the existing pipeline network in south Texas, by a short connecting line yet to be built. Some construction would be required to connect new discoveries with the gas pipeline network. Facilities to transport new Alaskan gas could be quite costly, especially if it proves necessary to liquefy the gas.

For the natural gas industry the major problem will be financing the gas pipeline from the Alaskan North Slope.[86] The presently approved route parallels the oil pipeline to the vicinity of Fairbanks, and then follows the Alaskan highway into Canada, finally reentering the U.S. in Montana. One branch is to serve the West. Gas for parts of the country not directly served will likely be supplied by exchange. Southern California will receive gas through existing pipelines by redirecting gas from Texas and New Mexico which now goes to supply other markets. Midwestern customers now supplied with Gulf Coast gas will receive Alaskan gas, with their Gulf Coast supply being redirected to the Northeast.[87]

The project will be one of the more expensive undertaken, with total costs estimated at $10 to $12 billion.[88] The project consists of several different sections, each the responsibility of a different group of companies. Because of requirements that the Canadian segment be Canadian controlled, it will be built by a Canadian consortium and financed largely by Canadian equity capital.[89]

The project is to be financially self-sufficient. The gas transmission companies will contract to take the gas on a long-term basis. Purchase commitments will be used as security to borrow most of the funds required.[90] In effect, the consumer will be bearing most of the risk and, presumably, receiving a lower price for gas, as the financing can be obtained at lower interest rates and less equity participation will be required. Traditionally, stockholders have borne the risk. For most gas pipelines risk is fairly low because gas has usually been available at prices substantially below the costs of competing fuels, and rate adjustments have been permitted which recover costs. The delivered price of gas was usually low enough to ensure that the final user would willingly pay higher prices for gas rather than shift to another source of fuel. However, Alaskan gas is expected to have a delivered cost which will be near or above the costs of alternative fuels.[91] If the gas is separately priced, it is possible that many distributors and consumers would be reluctant to contract for it as other fuels may be available in the future at lower cost.

The Alaskan gas will be "rolled-in" rather than separately priced.[92] This means that a gas transmission company buying Alaskan gas will average its cost with that of other sources and charge its customers a single price. Gas transmission companies will be willing to sign long-term contracts agreeing to tariffs adequate to recover the costs of pipeline construction, given the benefit of "rolled-in" prices. With the security of such contracts, most of the costs can be financed by debt. This is to permit 75 percent debt financing with the remainder to be financed by sales of stock.[93] If earnings are assured, the stock will be attractive to investors. The key to this financing scheme is the provision that the full cost of constructing and operating the pipeline is to be paid by the customers for the natural gas.

The Northwest Pipeline Company has proposed that construction be assisted by tax-free bonds. This would be done by having an agency of the State of Alaska issue (but not guarantee) these bonds, and then use the proceeds to purchase $1 billion worth of pipeline company debt. The net effect would be to provide tax-exempt financing to the pipeline company. This form of financing would require special legislation from Congress.[94]

A number of other large projects, including LNG and coal gasification, will also be financed by these same companies. Projects to import LNG will not create the need for new pipelines as they will generally be located near the markets served. Indeed, by supplying gas that might otherwise come from domestic producing areas, the LNG projects will tend to create surplus capacity in the pipeline system.

If the large-scale gasification projects discussed in Chapter 8 occur, additional pipelines will be required. The cost of these new pipelines will be generally small relative to the total cost of the projects, and transmission companies should be able to finance them in the traditional manner. In some cases, gasification sites are near existing pipelines which have excess capacity, such as those proposed to utilize New Mexico or Arizona coal. Table 38 shows only the gas transmission and distribution costs. It indicates modest increases under the medium-growth scenario for the period 1975 to 1985, followed by record growth from 1985 through the year 2000. The same general pattern prevails in the other two scenarios. The dramatic increase after 1985 is largely accounted for by the anticipated development of Alaskan gas and its shipment to the contiguous 48 states. Table 50 provides detailed estimates for gas pipeline capital investment.

AVIATION

This section discusses capital and labor requirements of the aviation industry, including airways, airports, commercial air carriers, and general aviation.

AIRPORTS

Air traffic growth will put added pressure on the nation's airport facilities. Because it is widely agreed that few new large airports will be built by the year 2000, many airport authorities have called for the physical expansion of existing air carrier airports, and more rapid development of commuter and reliever airports.[95]

Airports generate revenues predominantly from the rental of space and facilities, not from landing fees or other operating charges.[96] Except for the largest facilities, net income is usually insufficient to pay for land and capital.[97] Operations, including landings, are thus supported out of other airport income, the argument being that the community at-large, not merely the facility users, benefits from the airport. In effect, the reason for providing an airport—to accommodate the landing and take-off of aircraft—becomes of secondary significance in terms of revenue requirements of the facility. The airport pricing mechanism therefore offers no guidance in resource allocation. Landing fees neither cover the out-of-pocket cost of providing runways nor the increased marginal costs resulting from peak-period use.

Direct Federal involvement in airport development increased with the establishment in 1970 of the present Airport Development Aid Program (ADAP).[98] Legislation enacted in 1976 expanded ADAP.[99] A sum of $625 million has been authorized for airport development in fiscal year 1980 and the 96th Congress is considering extending the program.[100] Despite growing Federal involvement, airport capital requirements are met chiefly at the local level, mostly through the sale of general obligation or revenue

TABLE 50. Cumulative capital investment in gas pipelines (billions of 1975 $)

Source	Extraction			Conversion/ Processing			Transmission			Distribution			Total		
	1985	1995	2000	1985	1995	2000	1985	1995	2000	1985	1995	2000	1985	1995	2000
Low-Growth Scenario															
LNG				.31	.66	.67	.13	.28	.29	.12	.24	.25	.56	1.18	1.21
Hi Btu Synthetic		.33	.88		1.81	4.99		.05	.14		.02	.09		2.21	6.1
Offshore Atlantic	4.30	5.19	3.16	.08	.09	.05	.26	.32	.20	.07	.09	.05	4.71	5.69	3.46
Alaska	1.59	12.79	15.15	.08	.60	.70	3.96	31.91	37.59	.07	.61	.71	5.70	45.91	54.15
Lower 48	1.12			.06			.06			.06			1.30		
Lo Btu Synthetic		.09	.23		.21	.57		.01	.04		.07	.18		.38	1.02
Total	7.01	18.40	19.42	.53	3.37	6.98	4.41	32.57	38.26	.32	1.08	1.28	12.27	55.37	65.94
Medium-Growth Scenario															
LNG				.74	.89	.96	.31	.39	.11	.25	.33	.36	1.30	1.61	1.43
Hi Btu Synthetic		1.51	4.45		7.10	24.62		.26	.77		.14	.43		9.01	30.27
Offshore Atlantic	2.83	6.31	6.19	.06	.10	.10	.17	.39	.37	.06	.11	.10	3.12	6.91	6.76
Alaska	.37	14.55	17.81	.03	.68	.84	.91	36.34	44.20	.02	.70	.84	1.33	52.27	63.69
Lower 48	1.48	1.89	1.89	.08	.11	.11	.08	.11	.11	.08	.10	.10	1.72	2.21	2.21
Lo Btu Synthetic		.28	.82		.70	2.01		.04	.13		.22	.63		1.24	3.59
Total	4.68	24.54	31.16	.91	9.58	28.64	1.47	37.53	45.69	.41	1.60	2.46	7.47	73.25	107.95
High-Growth Scenario															
LNG				.88	.90	.93	.38	.38	.36	.33	.33	.32	1.59	1.61	1.61
Hi Btu Synthetic		1.30	4.67		7.13	25.79		.23	.77		.126	.46		8.78	31.69
Offshore Atlantic	2.12	7.10	6.96	.03	.12	.12	.13	.43	.42	.03	.13	.12	2.31	7.78	7.62
Alaska		16.68	20.09		.78	.93		41.63	49.83		.79	.95		59.88	71.80
Lower 48	4.14	3.30	3.18	.23	.19	.18	.23	.19	.18	.22	.18	.18	4.82	3.86	3.72
Lo Btu Synthetic		.59	1.38		1.45	3.40		.09	.21		.46	1.07		2.59	6.06
Total	6.26	28.97	36.28	1.14	10.57	31.35	.74	42.95	51.77	.58	2.02	3.10	8.72	84.51	122.50

SOURCE: NTPSC forecasts.

bonds, with some state assistance.[101] General obligation bonds are serviced out of general tax receipts. For revenue bonds, income from airport operations is pledged against the debt requirements. Revenue bonds are somewhat less burdensome to the community, but are available only to airports having large volumes of air traffic. In these instances, the airlines typically pledge that airport income from space rentals and landing fees will be sufficient to pay interest and principal. The fees charged the airlines are raised, if necessary, to pay operating expense and capital charges, but reduced if a surplus materializes.

Forecasts of airport capital and land requirements by the NTPSC are based on projected trends in the relevant input/output ratios, air traffic growth projections, and the most recent National Airport System Plan. The projected levels of capital investment are decidedly more conservative than those of other recent forecasts. They reflect the slowdown in the rate of traffic growth during the early- and mid-1970s, increased barriers to airport construction and development, and the understanding that the NASP is based on pre-existing state airport plans. Few state plans are so long term as to include capital development two decades hence. The NTPSC estimates appear in Table 51. If traffic growth exceeds that projected by the NTPSC medium-growth scenario, and barriers erected by environmental, economic and land-use considerations can be overcome, the NTPSC capital and land requirements forecasts can be considered conservative.

To date, much airport development has been designed to meet the needs of peak-period travelers. Forecasts of airport land and capital requirements, including those by the NTPSC, are usually based on a continuation of current public policy and airport operating procedures. Airports, it is assumed, will continue to rely on facility rentals rather than landing fees. Airport capital needs, then, will remain a function of peak-period travel demands. The result will be more investment in facilities than would be necessary if the landing fees charged were commensurate with the costs of providing long-run capacity or resolving short-run congestion.

A recent study by Smith, Maxfield, and Fromovitz,[102] carrying forward earlier work by Carlin and Park,[103] used an airport cost simulation model to

TABLE 51. Airport capital investment and land requirements (millions of 1975 $)

Period	Structures	Equipment	Land	Total
Low-Growth Scenario				
1976–1980	4411	237	1381	6029
1981–1985	4261	221	1445	5927
1986–1990	3766	202	1477	5445
1991–1995	3536	190	1573	5299
1996–2000	3459	186	1573	5218
Total	19433	1036	7449	27918
Medium-Growth Scenario				
1976–1980	4411	237	1894	6542
1981–1985	4438	239	2312	6989
1986–1990	4076	219	2729	7024
1991–1995	4018	216	2858	7092
1996–2000	3925	211	2858	6994
Total	20868	1122	12651	34641
High-Growth Scenario				
1976–1980	4411	237	2376	7024
1981–1985	4595	247	2922	7764
1986–1990	4413	237	3661	8311
1991–1995	4403	237	3661	8301
1996–2000	4311	232	2822	7365
Total	22133	1190	15442	38765

Airport land requirements

	Airport Land (millions of acres)		
Year	Low-Growth Scenario	Medium-Growth Scenario	High-Growth Scenario
1975	2.58	2.58	2.58
1980	3.01	3.17	3.32
1985	3.46	3.89	4.23
1990	3.92	4.74	5.37
1995	4.41	5.63	6.51
2000	4.90	6.52	7.42
Total	22.28	26.53	29.43

SOURCE: Estimates prepared for NTPSC by Jack Faucett Associates.

investigate methods (other than investment) of expanding airport capacity. The purpose was to analyze how requirements for additional land and capital might be reduced by either diverting general aviation traffic to reliever airports or charging landing fees based, not, as now, on aircraft weight, but on the marginal costs of congestion and capacity engendered by peak usage.

The authors found that both policies would substantially reduce requirements for airport expansion and construction. The policy of peak spreading has the additional advantage of providing planners with information useful for investment decisionmaking. The study also found that nearly all of the major airport investment requirements reported in state system plans were either avoidable or could be postponed if peak-period pricing or general aviation diversion were instituted. These findings support those made earlier[104] that the value of time to the traveler must be very high to justify general aviation operations during peak periods at major airports.

Finally, it should be noted that the charges necessary to divert general aviation traffic may be below the cost imposed by it. For example, Carlin and Park estimated that the peak-period general aviation traveler at John F. Kennedy International Airport in 1969 would have to value his time at $2,000 per hour to justify his position in the queue. An increase in the general aviation landing fee from $5 to $25 was all that was required to reduce congestion considerably.[105]

THE AIRPORT AND AIRWAY TRUST FUND

Since 1970, the Federal government has contributed to airport and airway capital projects from the Airport and Airway Trust Fund established under the Airport and Airway Development Act of 1970.[106] Since the signing of the original act, the use of the Trust Fund has undergone several changes. In 1971 the DOT's Federal Aviation Administration, which administers the Trust Fund, was prohibited from using Trust Fund receipts for operation and maintenance expenses of air navigation facilities, which represent 70 percent of total Federal aviation outlays.[107] Through further amendments in 1973 and in 1976,[108] Trust Fund authorizations and the Federal share of matching grants were increased. The 1976 amendments also provided a new formula for distributing funds and permitted some FAA operation and maintenance expenditures to be covered by Trust Fund receipts.

Over 80 percent of annual receipts to the Trust Fund come from an 8-percent ticket tax imposed on domestic passenger tickets. A domestic air cargo 5-percent way bill tax, a $3 international passenger enplanement tax and a 7-cents per gallon fuel tax on general aviation each currently contributes about equal amounts to the Trust Fund.

Up to two-thirds of the annual appropriations for the development of air carrier airports is distributed according to an enplanement formula, with a fixed share allocated to each state based on population and land area; the rest is left to the Secretary of Transportation's discretion.

Only those public airports which are included in the National Airport System Plan (NASP) prepared by the FAA may receive ADAP grants.[109] The entry criteria for inclusion in the NASP vary for each type of airport. Typical projects eligible for funding have been:[110]

1. Land acquisition;
2. Runway construction;

3. Apron and taxiway construction;
4. Airport lighting;
5. Passenger terminals;
6. Obstruction removal;
7. Fire/rescue equipment and buildings;
8. Airport access and service roads; and
9. Electronic and visual approach aids.

It should be noted that the Federal share for ADAP grants may vary due to the type of airport and the type of project in accordance with the 1976 amendments. The Federal share is as follows:[111]

Air Carrier Airports	
Large and medium hub airports	75%
Others	80%
Terminal Buildings	50%
Commuter Airports	80%
Reliever Airports	80%
General Aviation Airports	80%

PROJECTED TRUST FUND REVENUES AND FAA EXPENDITURES

Revenues for the Airport and Airway Trust Fund were projected on the basis of the NTPSC and the FAA activity forecasts to the year 2000 in 1975 constant dollars (Table 52). The results illustrate the different growth patterns in real terms of an ad valorem versus a flat-rate fee. Revenues from the domestic passenger ticket tax and domestic air cargo tax are expected to more than triple in constant dollar terms by the year 2000, following increased passenger miles and freight ton-miles. On the other hand, the international passenger enplanement and aircraft registration and weight taxes will hardly keep up with projected inflation, despite the growth in new aircraft and international passenger movements. By the year 2000, domestic passenger and air cargo taxes will comprise 94 percent of total Trust Fund revenues compared with their 1975 share of 86 percent.

Revenues from the general aviation fuel tax are expected to increase in real terms in spite of the flat fee per gallon. This is because general aviation hours flown are anticipated to increase substantially, more than compensating for inflation. The additional tax revenues, however, will not be commensurate with the rapid growth in general aviation activity.

Projected Federal aviation expenditures were estimated based on NTPSC aviation activities forecasts, the NASP distribution of capital expenditures for 1978 to 1987, and presently mandated Federal shares for various airport development projects. Table 53 shows the type of expenditure and whether the financing is to be generated from the Trust Fund or from general revenues.

TABLE 52. Forecast annual revenues to the airport and airway trust fund,[a] medium-growth scenario (millions of 1975 $)

Type of Tax	1975[b]	1980	1985	1990	2000
1. Domestic Passenger Ticket Tax, 8%[c]	778.1	974.3	1220.0	1542.3	2464.7
2. Domestic Air Cargo Waybill Tax, 5%[d]	54.0	70.6	92.2	113.3	171.0
3. International Passenger Enplanement Tax, $3[e]	55.3	61.4	61.9	61.6	58.8
4. Aircraft Registration Tax, $25/aircraft[f]	[g]20.4	4.1	4.1	3.8	2.8
5. Aircraft Weight Tax, 2¢/lb non-turbine, 3 1/2¢/lb turbine[h]		19.7	21.5	22.4	20.5
6. General Aviation Fuel Tax, 7¢/gallon[i]	54.4	73.1	83.1	89.3	96.6
7. Aircraft Tire & Tube Tax[j]	0.9	0.9	0.9	0.7	0.5
Total	963.1	1204.1	1483.7	1833.4	2814.9

[a] These projections are approximations using various growth factors and assuming inflation of 5% per year.

[b] Base year value from Charles River Associates, *An Analysis of The Impacts of Selected Transportation Issues on National Transportation Goals, Vol. II,* prepared for NTPSC, Cambridge, Mass: April 1978, p. M–17.

[c] Base year value increased in proportion to domestic passenger travel growth forecast by the NTPSC.

[d] Base year value increased in proportion to U.S. domestic air freight ton-miles forecast by the NTPSC.

[e] Base year value increased in proportion to NTPSC forecast growth in U.S. international air travel.

[f] Projection of FAA estimates to 1990 and NTPSC extrapolations to 2000. Federal Aviation Administration, *FAA Aviation Forecasts, Fiscal Years 1979–1990,* Washington, D.C.: Government Printing Office, September 1978, pp. 55, 57.

[g] Base year includes both registration and weight tax.

[h] Projection of FAA estimates to 1990 and NTPSC extrapolations to 2000. FAA, *Accrued Liabilities to the Airport and Airways Trust Fund, FY 1978–1990,* Washington, D.C.: September 1978.

[i] Projection of FAA estimates to 1990 and NTPSC extrapolations to 2000. *FAA Aviation Forecasts, Fiscal Years 1979–1990,* pp. 59, 62.

[j] Tires: 5¢/lb.; tubes: 10¢/lb. Base year value increased in proportion to forecast operations at airports with FAA traffic control service.

Accrued revenues to the Trust Fund and funding requirements for 1976 to 1985 and for 1986 to 2000 are presented in Table 54. According to these estimates and the NTPSC capital needs projections for airway and airport development, funds will be just sufficient to meet the Federal government's share of capital investment through 1985. After 1985 the Trust Fund will begin to accumulate a significant surplus as revenues increase and investment needs remain steady.

TABLE 53. Annual Federal funding requirements for airports and airways (millions of 1975 $)

Type of Expenditure	1975 Trust Fund	1975 General Revenues	1985 Trust Fund	1985 General Revenues	2000 Trust Fund	2000 General Revenues
Airway Obligations						
Operations		1,418	296	2,013	408	3,513
Facilities & Equipment	235		285		319	
Research & Development	61		80		80	
Airport Obligations						
ADAP	324		896		788	
Total	620	1,418	[a]1,558	2,013	1,595	3,513

SOURCES: For 1975 estimate: Charles River Associates Inc., *An Analysis of the Impacts of Selected Transportation Issues on National Transportation Goals, Vol. II,* prepared for NTPSC, April, 1978, p. M–14. For forecasts: NTPSC, 1979.

[a] Number rounded to the nearest million.

AIRWAYS

Responsibility for the operation, maintenance and development of the nation's airways is vested in the Federal Aviation Administration (FAA). Federal expenditures for aviation purposes for the period 1977 to 1986 are estimated at $30.9 billion in 1975 dollars.[112] Over the period 1977 to 1986, according to NTPSC estimates, the FAA will allocate $2.8 billion to upgrade the air traffic control system. An additional $800 million will be dedicated to research, engineering, and development programs designed to improve the safety and efficiency of aviation.

The NTPSC forecast of capital investment in airway facilities and equipment through the year 2000 is presented in Table 55. Forecasts for the medium-growth scenario are based primarily on the FAA's most recently published National Aviation System Plan and subsequent FAA modifications.[113] Expenditures beyond 1986 were projected on the assumption that replacement investment needs would increase at a rate of 2 percent annually, growth-related investments would remain proportional to the growth in enplanements, and the remaining share would decline at a 2 percent annual rate.

The NTPSC estimates of airway capital requirements are similar or somewhat below those of several earlier forecasts. For example, while the NTPSC estimate over the 1976 to 1990 period calls for $4.4 billion, a 1973 estimate by the Aviation Advisory Commission projected $4.0 billion over the 1973 to 1985 period.[114] *Trends and Choices* reported that between $5.2 and $5.4 billion would be invested in airways over the 1975 to 1990 period, depending on whether or not general aviation is charged the full cost of its use of the aviation network.[115] The NTPSC estimate differs from the earlier ones, partly because of differences in projected traffic growth rates and assumptions about improvements in capital productivity. Nevertheless, the differences among the forecasts are not large.

TABLE 54. Accumulated Federal funding requirements for airports and airways (millions of 1975 $)

Type of Expenditure	1976–1985 Trust Fund	1976–1985 General Revenue	1985–2000 Trust Fund	1985–2000 General Revenue
Airway Obligations	2,614	14,542	5,280	36,167
Operations	2,575		4,611	
Facilities & Equipment	669		1,200	
Airport Obligations				
ADAP	10,216		15,938	
Total	16,074	14,542	27,029	36,167
Trust Fund Revenues	12,200		32,200	
Difference	(3,874)		5,171	

SOURCE: NTPSC, 1979.

TABLE 55. Forecast airways capital investment, by scenario (millions of 1975 $)

Period	Structures	Equipment	Total
Low-Growth Scenario			
1976–1980	188	960	1,148
1981–1985	258	1,169	1,427
1986–1990	282	1,204	1,486
1991–1995	301	1,231	1,532
1996–2000	317	1,276	1,593
Total	1,346	5,840	7,186
Medium-Growth Scenario			
1976–1980	193	990	1,183
1981–1985	278	1,299	1,577
1986–1990	307	1,345	1,652
1991–1995	340	1,451	1,791
1996–2000	355	1,488	1,843
Total	1,473	6,573	8,046
High-Growth Scenario			
1976–1980	197	1,017	1,214
1981–1985	297	1,413	1,710
1986–1990	332	1,499	1,831
1991–1995	368	1,627	1,995
1996–2000	383	1,665	2,048
Total	1,577	7,221	8,798

SOURCE: NTPSC forecasts.

Capital expenditures on the nation's airways over the next decade will be largely for installing an upgraded third-generation air traffic control system, known by the acronym UG3RD. UG3RD has as its major elements the following:

1. A Microwave Landing System to replace the present VHF Instrument Landing System;
2. A Discrete Address Beacon System (high performance radar);
3. An Airborne Collision Avoidance System;
4. Additional automation of enroute and tower air traffic control functions;
5. A Wake Vortex Avoidance System;
6. Cooperative International Transoceanic Aeronautical Satellite development (AEROSAT);
7. Modernization of flight service stations;
8. Development of an Airport Surface Traffic Control System; and
9. Implementation of Area Navigation Routes (RNAV).[116]

Introducing the entire UG3RD is expected to cost between $1 billion and $1.6 billion. Its primary purpose is to expand the capacity of the nation's aviation infrastructure to meet projected growth. However, much of this investment might be avoided if policies designed to spread traffic peaks were introduced.

Employment projections for operating the nation's airway network were not developed by the NTPSC, but recently an attempt to project labor needs through the year 2000 was made by the FAA. This study estimated production functions for tower and enroute facilities and used them to project least-cost input combinations. The results appear in Appendix Table 49

AIR CARRIERS

Since World War II, air carrier profits have been erratic, seldom reaching the CAB's target rate of 12 percent even in years of rapid traffic growth. Under these circumstances, the industry has augmented internal resources by drawing heavily on the capital markets. After initial reliance on commercial banks, the airlines were subsequently obliged by the onset of the jet age in the 1960s to find creditors capable of providing funds over periods of 15 to 25 years. Accordingly, they turned to insurance companies. Some also sold equity and subordinated convertible debentures so as to allow greater leverage and to keep debt/equity ratios within "normal" bounds. By the mid-sixties, unsecured financing and cash generated internally were becoming steadily less available. The carriers turned to equipment financing.[117]

Relying on borrowing and leasing in periods when profits were low seriously undermined the airline industry's financial position. Long-term lenders began restricting the advance of further credit. Other factors—low profits, uncertainty over deregulation, proposed changes in the bankruptcy law and in the rules governing depreciation—combined to make the airlines less attractive to investors.[118]

Improved profits, beginning in 1976, allowed the carriers to re-enter the equity markets after an absence of five years. The terms were expensive. Except for those in strong financial condition (Delta, Braniff, and Northwest Orient, for example), most airlines were obliged to sweeten their public offerings with such inducements as convertibility features. Despite prices below book values, some carriers have returned to the equity markets for some of their capital requirements and to improve debt/equity ratios. Emulating the railroads, the air carriers have also begun using equipment trust certificates. Some acquired expensive jumbo jets by combining several forms of capital financing.

A recent surge in traffic has been engendered by deregulatory actions. Once again internal funds are becoming an important source of capital for some airlines. If the industry continues to thrive under a deregulated climate, banks and insurance companies are more likely to be active in the process of airline capital formation.

Long-term forecasting of airline resource requirements is complicated by uncertainties surrounding deregulation. Projections predating deregulation, based, as they are, on historic relationships and a different operating environment, may be wide of the mark. The NTPSC's forecast was derived from estimates of air traffic growth and projected input/output relationships over the stated period. These investment estimates are presented in Table 56.

The NTPSC aviation activity forecasts presented in Chapter 9 are in general agreement with those made elsewhere. To the extent that traffic induced by deregulation triggers the need for additional resources, NTPSC's "most likely" forecast (medium-growth scenario) may be conservative.

Deregulation has resulted in higher load factors and better utilized equipment, both of which tend to reduce capital requirements. Some observers fear that deregulation will bring financial chaos. Most analysts believe, however, that in this new environment, the carriers will satisfy their capital requirements with little difficulty.[119] According to a recent study, if the airlines would improve their correlation of investment with earning power (to avoid the excess capacity that has plagued them in the past), they could lower their debt/equity ratios to 1:1 and simultaneously generate funds sufficient to finance capital acquisitions.[121]

Table 57 summarizes these estimates for eleven trunk carriers. Note that not all firms are expected to be equally successful in meeting their capital require-

TABLE 56. Estimates of domestic airline capital investment

	Structures		Equipment		
Period	Expansion	Replacement	Expansion	Replacement	Total
Low-Growth Scenario					
1976–1980	410	332	4,317	14,465	19,524
1986–2000	605	644	3,403	24,876	29,528
Total	1,015	976	7,720	39,341	49,052
Medium-Growth Scenario					
1976–1980	794	361	9,653	15,692	26,500
1986–2000	2,262	991	22,275	38,058	63,586
Total	3,056	1,352	31,928	53,750	90,086
High-Growth Scenario					
1976–1980	1,132	386	14,352	16,777	32,647
1986–2000	3,610	1,255	37,629	47,997	90,491
Total	4,742	1,641	51,981	64,774	123,138

SOURCE: Estimates made for NTPSC by Jack Faucett Associates. Based on the use of two techniques: replacement values were computed using continuing inventory accounting techniques; expansion values were based on projections of historical trends in capital-output ratios.

TABLE 57. Summary of airline investment capacity versus needs, 1976 to 1990 (billions of dollars)[a]

Firm Rank	Investment Capacity	Investment Needs	Surplus or (Shortfall)	Surplus or (Shortfall) % of Investment Capacity
1	$10.5	$ 4.8	$ 5.7	54.3
2	14.3	7.4	6.9	48.3
3	4.8	3.0	1.8	37.5
4	18.4	11.9	6.5	35.3
5	3.9	2.6	1.3	33.3
6	3.6	3.2	0.4	11.1
7	3.1	2.9	0.2	6.5
8	7.9	9.4	(1.5)	(19.0)
9	4.9	6.9	(2.0)	(40.8)
10	6.0	9.2	(3.2)	(53.3)
11	4.6	8.1	(3.5)	(76.1)
Total	$82.0	$69.4	$12.6	15.4)

SOURCE: *Aviation Week & Space Technology* 107 (11 July 1977), p. 26.

[a] This forecast is in current dollars and, therefore, the absolute figures are not strictly comparable to NTPSC or other projections discussed previously.

ments. Some carriers have operated more efficiently and more profitably than others in the past. The performance differential could widen under deregulation.

Table 58 displays projections of total investments in aircraft flying between the U.S. and foreign points (excluding Canada) to the year 2000. Estimates employing the medium-growth scenario portray a general increase of investment in aircraft equipment, with the average annual investment for the years 1986 to 2000 being larger in real dollars than for the 1975 to 1985 period.

The airlines' purchase of the fastest, most technologically advanced equipment has been a cause of excess capacity. Current acquisition policies, however, appear to stress economic efficiency rather than technological virtuosity. The airlines' changed preferences are particularly evident by reference to the aircraft most recently offered by manufacturers. Fuel efficiency, the ability to use shorter runways, and reduced noise emissions are notable improvements in the latest commercial airplanes.

As profits improve, air carriers will find it easier than in the recent past to raise necessary capital. The needs of the industry may be different. The relative size and distribution of resource demands may also change, but markets should adapt.

TABLE 58. Capital investment in international aviation aircraft[a] (millions of 1975 $)

Equipment	1975–1985	1986–2000	Total
Low-Growth Scenario			
Number of Aircraft Replaced	416	701	1,117
Value of Replaced Aircraft	8,616	20,918	29,534
Value of Additional Aircraft	3,629	3,606	7,235
Subtotal	12,245	24,524	36,769
Medium-Growth Scenario			
Number of Aircraft Replaced	497	1,024	1,521
Value of Replaced Aircraft	8,786	31,503	40,289
Value of Additional Aircraft	4,936	12,850	17,786
Subtotal	13,722	44,353	58,075
High-Growth Scenario			
Number of Aircraft Replaced	557	2,316	2,873
Value of Replaced Aircraft	11,702	58,013	69,715
Value of Additional Aircraft	9,691	33,096	42,787
Subtotal	21,393	91,109	112,502

SOURCE: Estimates for NTPSC by Jack Faucett Associates.

[a] These estimates are based on use of two techniques: replacement values were computed using continuing inventory accounting techniques; expansion values were based on projections of historical trends in capital-output ratios.

LABOR

Airline labor requirements are expected to increase, but less rapidly than growth in traffic. The relevant data appear in Appendix Table 50.

GENERAL AVIATION

For use in making capital estimates, general aviation was defined to include all non-air-carrier civilian aircraft (including helicopters). General aviation activity grew at a 7.3 percent annual rate over the 1959 to 1972 period. Since 1972, the growth rate, especially for general, non-business travel, has declined. Table 59 shows the 1977 distribution of the general aviation aircraft fleet.

The NTPSC's projection incorporates the FAA's prognosis. To obtain the NTPSC capital forecasts, a capital-output ratio was derived from historic data. Output was expressed in terms of hours flown. The capital needs projections given in Table 60 were developed on the basis of this relationship, an estimated annual replacement rate of 7.5 percent, and medium-growth scenario conditions.

These estimates are highly sensitive to three assumptions: 1) the capital-output ratio remains stable; 2) no drastic technological changes are introduced; and 3) airports continue to charge general aviation aircraft less than full cost for the use of landing fields. If fees commensurate with cost were levied, growth in general aviation traffic might be considerably dampened.

DOMESTIC MARINE TRANSPORTATION

Marine transport includes both domestic and international waterborne commerce. This section estimates future capital requirements for domestic transportation of the commerce projected in Chapter 9, separating the capital needed for facilities and structures from that needed for equipment.[121]

TABLE 59. General aviation fleet, by aircraft type, 1977

Type of Aircraft	Percent[a]	Number of Aircraft
Single engine, piston	81.8	145,124
Multi-engine, piston	11.9	21,112
Turbo prop	1.4	2,484
Helicopters	2.4	4,435
Non-motorized (gliders, etc.)	1.8	3,193
Total		176,348

SOURCE: Federal Aviation Administration, *FAA Aviation Forecasts, FY 1978–79,* Washington, D.C: 23 September 1977.

[a]Total does not add to 100 due to rounding.

TABLE 60. Forecast investments in general aviation, by scenario, 1975 to 2000 (millions of 1975 $)

	1975–1985	1986–2000	Total
Low-Growth Scenario	11,796.5	26,200.1	37,996.6
Medium-Growth Scenario	12,461.5	28,879.9	41,341.4
High-Growth Scenario	12,620.5	29,577.8	42,198.3

SOURCE: NTPSC estimates by Peat, Marwick, Mitchell & Co.

The vast majority of domestic water transportation, including port activity, is unregulated and data are not readily available. There is also an accounting problem of allocating the available data for such common-use facilities as deep-draft channels and ports used by both domestic and international vessels. The NTPSC has differentiated between the domestic and international segments and between private, Federal, state, and local sources of capital.

CURRENT POLICY AND THE FEDERAL ROLE

Presently there is Federal ownership, operation, and maintenance of waterways in the U.S. Any user, commercial or private, has access to the waterways and harbors. The infrastructure of the shallow-draft inland navigation system includes approximately 170 dams, 255 locks, and 25,543 miles of navigable channels.[122] The Federal government, through the U.S. Army Corps of Engineers and the U.S. Coast Guard, finances the construction, maintenance, and operation of channels and offshore harbor facilities, including navigation aids, anchorages, and main-channel access for vessels entering or leaving port. Some port development occurs through Economic Development Administration grants, as part of broader Federal efforts to stimulate economic growth. The St. Lawrence Seaway Development Corporation operates the U.S. section of the Seaway and charges tolls to cover its cost.

An Inland Waterway Trust Fund exists, from which money may be withdrawn for waterway improvements. Under current policy, the size of the Fund does not limit Federal expenditures for waterway development, because funds for waterway improvements may also be appropriated from the General Treasury.[123] Revenues for the Trust Fund are derived from a waterway user charge, levied on fuel consumed in waterway operations, with rates as shown in Table 61.

PROJECTED INLAND WATERWAY TRUST FUND REVENUES

Revenues from the waterway user charge will depend upon the consumption of fuel. A study of the

TABLE 61. User charge for commercial transportation on inland waterways, rates by date effective[a]

Period	Rate
Oct. 1, 1980 – Sept. 30, 1981 =	4 cents/gal.
Oct. 1, 1981 – Sept. 30, 1983 =	6 cents/gal.
Oct. 1, 1983 – Sept. 30, 1985 =	8 cents/gal.
After Sept. 30, 1985 =	10 cents/gal.

SOURCE: Inland Waterways Revenue Act of 1978, Pub. L. 95–502, 92 Stat. 1696.

[a] Certain types of waterway traffic are exempt from the charge including deep-draft, ocean-going vessels, passenger vessels, state and local government users, and LASH and SeaBee barges. See: Joseph L. Carroll and Srikanth Rao, "Economics of Public Investment in Inland Navigation: Unanswered Questions," *Transportation Journal*, Vol. 17, No. 3, Spring 1978; and Robert H. Haveman, *The Economic Performance of Public Investments: An Ex Post Evaluation of Water Resources Investments*, Baltimore: Johns Hopkins, 1972.

TABLE 62. Inland waterway fuel consumed and user charge revenues, medium-growth scenario, 1972 to 2000 (millions of 1975 $)

Year	Gallons of Fuel (millions)	Tax Rate ($/gal.)	Total Revenues[a] (millions)
1972	561	n.a.	n.a.
1980[b]	738.7	n.a.	n.a.
1985	877.4	.08	$43.0
1990	1,042.1	.10	$50.1
2000	1,469.9	.10	$43.4

SOURCE: NTPSC estimates.

[a] Revenues adjusted by assuming a 5 percent annual rate of inflation.

[b] No revenues calculated in 1980 because the user-charge will not go into effect until October 1, 1980.

KEY: n.a. = not applicable.

potential impacts of waterway user charges prepared for the U.S. Army Corps of Engineers estimated that, in 1972, the towing industry consumed 561 million gallons of fuel on the Mississippi and Gulf Intracoastal Waterway.[124] Imposition of the user charge (which was not in effect in 1972) could result in a 6 percent reduction in fuel consumed.[125]

The NTPSC forecast of intercity freight indicates that inland waterway traffic (in tons) will grow at an average annual rate of 4 percent to 1985 and 3.3 percent thereafter.[126] This rate of growth is similar to the "unconstrained" projections of the Mid-America Ports Study for the Maritime Administration.[127] Because neither estimate accounts for diversion caused by congestion or user charges, future tax revenues were forecast by applying an annual increase of 3.5 percent to the 1972 figure for fuel consumption. The results are shown in Table 62.

The estimates in Table 62 illustrate that the user charge revenues will keep up with inflation only because of the higher waterway traffic and rate increases, but will not contribute an increasing sum in real terms to the Trust Fund. Appendix Table 51 shows the minimal variation in trust fund revenues across scenarios. These anticipated revenues are likely to fall far short of covering capital expenditures for the inland waterways, as forecast for the U.S. Army Corps of Engineers. (Recent Corps expenditure obligations are shown in Table 63.)

FEDERAL EXPENDITURES ON WATER TRANSPORTATION

Federal investment in water transportation facilities and the facilities of commerce comes from three principal sources: the Tennessee Valley Authority (TVA); the Coast Guard; and the U.S. Army Corps of Engineers. Total TVA aid to domestic water transport in 1975, as shown in Table 63, was $600,000, with only a small portion expended for capital construction or improvement. No new navigation facilities are expected to be built by TVA; however, some facilities may require rehabilitation during latter years of the projection period.

Coast Guard expenditures are of two types: "operating expense" and "acquisition, construction, and improvement" (ACI). The first category includes such items as search and rescue, aid to navigation, marine safety, environmental protection, law enforcement, and military readiness. ACI includes equipment and construction necessary to various Coast Guard missions plus navigation aids, including:

TABLE 63. Federal expenditures for water transportation, 1966 to 1975 (obligations in millions of current dollars)

	Army Corps of Engineers						
Fiscal Year	Construction	Operation & Maint.	Other	Total	TVA	U.S. Coast Guard	Grand Total
1966	285.7	126.0	76.6	490.3	4.0	122.5	614.8
1967	264.4	121.8	67.4	453.6	3.4	122.6	579.6
1968	257.6	134.6	70.8	463.0	—	130.0	593.0
1969	194.1	146.2	57.7	398.0	—	130.1	528.1
1970	179.1	179.8	50.4	409.3	—	153.2	562.5
1971	209.7	193.3	57.6	460.6	0.7	153.1	614.4
1972	211.7	223.1	56.1	490.9	2.4	176.7	670.0
1973	237.3	247.7	55.8	540.8	4.1	188.8	733.7
1974	220.9	303.8	89.3	614.0	1.5	187.1	802.6
1975	216.6	362.1	49.3	628.0	0.6	184.8	813.4

SOURCE: U.S. Department of Transportation, *Study of Federal Aid to Rail Transportation*, Washington, D.C.: January 1977, Appendix 12. Includes aid for domestic and international marine transportation. Does not include Maritime Administration subsidies.

"long range aids to navigation" (LORAN); floating and fixed aids; the issuance of bridge permits; bridge alterations; and ice breaking operations. According to DOT, the Coast Guard has spent approximately $2.9 billion in the last 30 years on direct aid to water transportation.[128] Of this amount, $1.1 billion (11 percent of all Coast Guard expenditures) is estimated to have been spent on inland waterways.[129] Appendix Table 52 displays Coast Guard expenditures by type in current dollars. In the strictest sense, few of these expenditures were for capital improvements. For this study, only ACI navigational aids were considered capital expenditures, of which 40 percent were allocated to domestic transportation and 60 percent to international marine transportation.

Recreation vessels impact water transport facilities, particularly inland navigation locks. In some cases, projects which were originally justified and built as commercial navigation facilities are used almost exclusively by recreation craft. For new locks and those not heavily utilized there is little interference or impact on lock capacity, but this changes where commercial traffic is heavy. No attempt was made to separate such costs or to allocate lock facility use by recreation craft versus commercial tows, but lock records indicate that non-commercial use is very significant.[130]

DOMESTIC CHANNELS, HARBORS, PORTS, AND FACILITIES

As shown in Table 64, about $270 million will be required to complete 16 improvements to the existing inland waterway system that were under construction as of July 1978. Table 64 also shows that nearly $2 billion will be required to complete three major additions to the existing system now under construction, and about $900 million will be needed to complete 24 harbor additions that are being constructed.

TABLE 64. Corps of Engineers projects (millions of 1975 $)

Inland and Intracoastal	Number	Total Federal Cost	Balance To Complete
Improvements to Existing System			
Under Construction	16	2,078.2	270.6
Authorized, not started	12	1,813.4	1,813.4
Additions to Existing System			
Under Construction	3	2,596.0	1,970.5
Authorized, not started	5	3,098.4	3,097.5
Deep Draft Harbors			
Under Construction	24	1,337.2	904.4
Authorized, not started	19	488.9	476.5

SOURCE: U.S. Army Corps of Engineers, July 1978. Adjusted to include Locks & Dam 26.

Table 65 displays estimates of total Federal investment for water transport for the 1975 to 2000 period.[131] These estimates include capital for harbors, ports, and facilities in addition to channels. Projected capital requirements after 1986 may appear conservative, but Corps projects shown in Table 64 include all authorized projects that may possibly be constructed over the next 25 years. Some of these projects, though authorized, appear marginally justified at best and may never be funded.

There are some 2,400 marine terminal facilities in the U.S. In 1974, 50 ports accounted for nearly 87 percent of total foreign and domestic waterborne commerce.[132] Over 60 percent of all U.S. port facilities are privately owned and operated. (See Appendix Table 53.) Statistics on private port development are difficult to obtain, but investment in inland shallow-draft and Great Lakes ports is expected to be modest, with the exception of massive terminals for the transshipment of western coal.[133] In addition to a $45 million facility at Superior, Wisconsin, new or expanded ports on the Great Lakes, near St. Louis on the Mississippi River, and on the Gulf Coast are being planned[134] to handle both domestic and export coal. The coal market is expected to be a major influence upon future water transportation, particularly in the Great Lakes. Coal terminals are usually privately owned, as are most inland waterway ports. Unlike general cargo ports, which are often owned by city or state governments, most bulk terminals are privately financed. For purposes of estimating total capital requirements, private investment was added to that of state and local government, as shown in Table 66.

According to a 1971 American Association of Port Authorities (AAPA) survey, the typical port earned a net return on investment between +2 and −2 percent after debt service.[135] Few public ports are financially successful as autonomous entities.[136] As

TABLE 65. Projected Federal capital requirements for domestic water transportation, 1976 to 1985 and 1986 to 2000 (millions of 1975 $)

Years	Existing System	Additions	Total
1976 to 1985	$ 820	1,950	2,770
1986 to 2000	1,830	3,520	5,350
Total	$2,650	5,470	8,120

SOURCE: NTPSC forecasts.

TABLE 66. Forecast of state, local government, and private capital requirements for domestic ports, harbors and facilities, 1976 to 2000 (millions of 1975 $)

Capital Requirements	1976–1985	1986–2000	Total
Replacement	85	315	400
Expansion	190	520	710
Total	275	835	1,110

SOURCE: NTPSC estimates.

such, public ports may find it increasingly difficult to finance major expansion.

Until recently, ports have resisted Federal assistance for fear that Federal involvement would restrict the competitive structure of the industry. In the fall of 1978 a resolution approved by the AAPA warned that state and local port agencies are finding it "increasingly difficult" to pay for Federal regulatory and development requirements.[137] Chairmen of the AAPA's committees were authorized to advise Congress that the Federal government should provide funding assistance whenever it imposes additional financial obligations on state and local port agencies through the implementation of its policies and laws.[138] The NTPSC's forecasting assumption, however, is that the Federal policy of non-involvement in port development will continue.

DOMESTIC MARINE EQUIPMENT CAPITAL REQUIREMENTS

As of September 1977, there were approximately 214 U.S.-flag vessels in the U.S. domestic ocean fleet, including 43 freighters and 170 tankers, with respective vessel capacities of 640,000 and 7,796,000 Dwt. There was one passenger vessel, and that too was used to transport cargo.[139] Under the Merchant Marine Act of 1920 (popularly known as the Jones Act), domestic-use ships must be constructed in the U.S. As of June 1977, the average age of the domestic fleet under the U.S. flag was 20.6 years, compared to 10.4 years for international trade vessels.[140]

The Great Lakes fleet contained 150 bulk carriers (2,674,361 Dwt) and 9 tankers (55,450 wt) as of September 30, 1977.[141] Because these vessels operate only in the Great Lakes, they are not exposed to the deteriorating effects of salt water. Consequently, a large percentage of the Great Lakes vessels built between 1900 and 1930 continue in operation today. Thus, total capital needs are less, because equipment can be replaced at a lower rate than the ocean fleet.

The Great Lakes fleet experienced a major transition as a consequence of the opening of the St. Lawrence Seaway in 1959. The old 14-foot Laurentian canal system limited ships to a maximum length of 250 feet. The larger dimensions of the Seaway can accommodate vessel lengths of up to 750 feet. Most of this transition construction has been completed. Demands for the shipment of western coal have led, however, to the construction of new 1,000-foot ships.

About 1,850 towing firms operate on the inland waterways.[142] Table 67 shows the characteristics of the towboat and barge fleet in 1975. While the trend is to larger towboats, those over 5,000 horsepower (h.p.) usually restrict their operations to points below St. Louis where open river conditions exist. Some older towboats of less than 500 h.p. are likely to be retired, but many may be used for short-haul movements and localized operations. Towboats exceeding 8,000 h.p. are expected to be built, but the medium-range boat with between 1,800 and 5,000 horsepower is likely to continue as the mainstay of the fleet.

The 1975 cost of towboats was about $1.9 million for a 4,000 hp. unit, $2.3 million for a 5,000 hp. boat, $2.7 million for a 7,000 hp. unit, and $3.7 million for those in the 10,000 hp. class. Barges cost between $200,000 and $300,000 each and have a useful life in excess of 30 years.[143]

TABLE 67. Number, size and types of towboats and barges, Mississippi River and Gulf intercoastal waterway, 1975

Towboats		Barges		
Class (horsepower)	Total Number	Type	Size	Total Number
		OH	245 × 35	245
300	748	OH	195 × 35	5,490
600	436	OH	175 × 26	2,890
1,200	610	OH	120 × 30	1,172
1,800	210	CH	195 × 35	4,650
2,500	91	DK	200 × 50	348
3,300	134	DK	195 × 35	510
4,300	73	DK	150 × 32	810
5,000	36	DK	100 × 26	1,230
5,700	32	TN	290 × 53	573
7,000	22	TN	240 × 50	760
8,400	11	TN	185 × 54	322
9,000	2	TN	195 × 35	790
10,000	4	TN	135 × 40	458
Total Number	2,409			20,248

SOURCE: U.S. Corps of Engineers, 1977.

KEY: OH = open hopper
DK = deck
CH = covered hopper
TN = tank

Table 68 contains estimates of capital requirements for all domestic ocean vessels, including those of the Great Lakes and inland waterways.

EQUIPMENT FINANCING

The return on investment of the inland towing industry appears adequate to refinance replacement equipment; expansion equipment can be financed internally or through commercial sources. Barges are often owned by shippers, particularly grain companies who rely on this equipment during seasonal peaks when for-hire equipment is scarce. Still, Federal assistance is available. The Merchant Marine Act of 1970[144] provides equipment financing aid for domestic waterway carriers from three sources: the Federal Ship Financing Program, the Capital Construction Fund (CCF), and the Construction Reserve Fund (CRF).

The Federal Ship Financing Program, established under Title XI of the 1936 Merchant Marine Act (as amended in 1970), provides Federal guarantees of debt obligations for ships built in U.S. yards.[145] Any towboat, barge, or tank vessel of 25 gross tons or more is eligible for assistance. The amount guaranteed generally does not exceed 75 percent of the actual cost of the vessel, tug or towboat, but may reach 87.5 percent under certain conditions. Since the program's inception, 101 river tugs costing $171 million have been involved, and about 1,650 barges costing a total of $346 million have been built under guarantee.[146] The amount committed thus far is 6 percent of total guarantees provided under Title XI (which was designed primarily to assist deep-draft ocean shipping engaged in foreign trade).

In NTPSC interviews, representatives of the inland towing industry expressed mixed views as to the value of the Title XI Program. Most firms engaged in inland water transportation are small and unable to meet the cost of the filing and reporting requirements mandated for ocean vessels. The price of an ocean vessel often exceeds $100 million compared to $2 to $5 million for an inland towboat. Critics also contend that firms unable to secure commercial financing should not be encouraged to enter the highly competitive towing business.[147]

TABLE 68. Forecast of capital requirements for domestic water transportation equipment, 1976 to 1985 and 1986 to 2000 (millions of 1975 $)

Equipment (Private)	1976 to 1985	1986 to 2000	Total
Inland Waterways	5,170	12,090	17,260
Domestic Ocean	1,220	2,600	3,820
Great Lakes	900	2,580	3,480
Total	7,290	17,270	24,560

SOURCE: NTPSC calculations from Jack Faucett Associates capital estimates, 1978. Estimates were disaggregated to remove "non-equipment" expenditures and to allocate between waterborne categories.

The CCF is another Federal financial assistance program of major importance to the U.S. Merchant Marine.[148] The CCF assists operators in accumulating capital to build and reconstruct vessels through the deferment of Federal income taxes on eligible deposits. The first CCF agreements were executed in the fall of 1971. Construction projects valued at $6.9 billion have been planned by fundholders over the next 20 years, of which $5.5 billion of construction is projected for the U.S. foreign commerce, $764 million for the Great Lakes, and $601 million for the non-contiguous, domestic trade.[149]

The CRF, a third Federal program, permits eligible parties to defer tax payments on gains from the sale of a vessel if the net proceeds are deposited in CRF and reinvested in a new vessel within three years.[150]

Investors have been attracted by the tax advantages acquiring equipment under Title XI, and then entering into management and leasing agreements with operators. However, many operators appear to prefer ownership instead, especially in an inflationary period. Some also view investment speculation by outside investors as detrimental to the stability of the inland towing industry.[151] Some waterway operators fear the involvement of railroads as outside investors, perhaps eventually leading to railroad takeover.

INTERNATIONAL MARINE TRANSPORTATION

Ninety-nine percent of the tonnage moving in overseas foreign trade is carried by water. Approximately 761.8 million long tons of commerce valued at $244.6 billion moved in U.S. foreign trade in 1976. U.S.-flag ships transported about 4.8 percent of this tonnage (but 17.9 percent of the cargo value).[152] Yet these statistics can be misleading because of the great disparity existing between the liner, tanker, and dry-bulk sectors of the U.S. shipping industry. The 1976 U.S.-flag share was 30.9 percent of all liner cargo, and liners make up about 88 percent of the U.S.-flag fleet.[153] This distinction is important to an analysis of U.S.-flag operations.

U.S. MARITIME CAPABILITY

U.S. maritime capability consists of the U.S.-flag fleet, the Effective U.S. Control (EUSC) fleet, and other, American-owned, foreign-flag vessels.

U.S.-flag vessels must be American-built, with all officers and at least 75 percent of the crew U.S.

citizens. (If a vessel is subsidized, the entire crew must be U.S citizens.) The construction and operation of most U.S.-flag vessels in foreign trade are subsidized in part through use of a construction-differential subsidy (CDS) and an operating-differential subsidy (ODS).[154] A subsidized vessel is determined to have an economic life of 25 years, at which time ODS is discontinued and the ship is usually "retired" or replaced by another subsidized vessel. A ship can also be rebuilt and the ODS extended. A non-subsidized vessel, on the other hand, is typically operated for about 35 years.

The EUSC fleet is a second group of American-owned and operated ships. Under the Neutrality Act of 1939, the U.S. could not transport Lend-Lease, military, or civilian cargo to the Allies in American bottoms. To circumvent the law, the U.S. government encouraged American owners to transfer ships to the registries of friendly, neutral, foreign countries. After the U.S. entered World War II, these ships returned to U.S. jurisdiction. As of June 1977, 339 tankers, 102 bulk carriers, and 28 liners were designated as EUSC vessels. In spite of agreements with Panama, Liberia, and Honduras that EUSC ships will be returned to U.S. control in times of national emergency, international law states that only the nation of registry has the right of requisition and control.[155]

The advantages realized by shipowners operating under foreign registry are great. American maritime unions are avoided and crew costs are significantly lower. Although modified by the 1975 Tax Reduction Act, tax benefits to EUSC shipowners are significant, because U.S. taxes on vessel earnings can be avoided or deferred. This causes loss of tax revenue; yet some contend that the EUSC foreign-flag system is the only way to keep U.S. operators competitive without heavy government subsidies, particularly in the dry-bulk and tanker trades.[156]

The final category of vessels potentially available to the U.S. contains ships owned by foreign affiliates of U.S. companies. These vessels, combined with the EUSC fleet, would make a total of 488 tankers, 113 bulk carriers, and 76 freighters potentially available to the U.S. during time of war or national emergency.[157]

PROJECTED U.S. MERCHANT FLEET

NTPSC projections of the U.S.-flag fleet, as shown in Table 69, are based on a report by MarAd, which estimates new construction of 474 vessels (19 per year) between 1976 and 2000.[158] Another MarAd report claims 83 U.S.-flag tankers and 45 bulk ships are additionally necessary for national security purposes by 1985.[159]

The financial viability of the U.S. Merchant Marine is central to the question of capital formation. Entering U.S. foreign trade as a U.S.-flag vessel operator depends, in the final analysis, on profitability, which is a function of competitive conditions in world shipping and the efficiency of the U.S.-flag fleet. Unless adequate returns can be foreseen, however, little unsubsidized capital investment will be made.

The U.S.-flag tanker trade has shown poor performance in recent years, with a rate of return of only 0.2 percent,[160] and is characterized by a high debt-to-equity ratio. The container fleet, which is expected

TABLE 69. U.S. fleet in foreign trade by ship type, by scenario, 1975 to 2000 (number of vessels, by type, by year)

		1980			1985			1990			1995			2000		
Ship Type	1975 Base	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
General Cargo Ships	106	78	80	82	69	76	81	30	37	41	14	28	21	12	18	23
Partial Containerships	20	16	16	16	25	27	29	33	40	45	42	56	67	48	81	89
Full Containerships	58	67	69	71	71	78	83	80	97	109	93	124	148	105	154	193
Barge Ships	23	18	19	20	20	22	24	20	24	27	20	26	31	18	27	34
Neo Bulk Carriers	0	0	0	0	1	1	1	2	2	2	4	5	6	4	6	8
Dry Bulk Carriers	3	6	6	6	17	29	20	23	28	31	31	41	49	37	55	69
Commercial Carriers	2	2	2	2	2	2	2	2	3	3	2	3	4	2	3	4
LNG Carriers	0	6	6	6	21	25	23	25	31	35	29	39	46	30	44	55
Liquid Bulk Carriers	38	47	48	49	45	52	41	41	50	56	41	55	65	36	53	66
Total	250	240	246	252	271	297	317	256	312	349	276	367	437	292	431	541

SOURCE: U.S. Maritime Administration's "Merchant Fleet Forecast of Vessels in U.S.-Foreign Trade," Washington, D.C.: May 1978, adjusted by NTPSC for differences in scenario assumptions.

KEY: L = Low-growth scenario.
M = Medium-growth scenario.
H = High-growth scenario.

to dominate the liner trades, generally exhibits a low debt-to-equity ratio (0.7:1) but erratic profitability.[161] Non-subsidized ships appear to have the lowest operating ratios, highest return on investment, and most rapid capital turnover.[162] Returns on investment fluctuate dramatically, indicating great sensitivity to market change, probably due to high capital intensity and the need for a large volume of cargo per voyage in order to use these vessels efficiently.

By the year 2000, the profile of the U.S. fleet is expected to be one of high capital cost, high technology, and concentration on specialty markets, meaning that container and LNG ships will predominate.

PROJECTED CAPITAL REQUIREMENTS

For the liner sector, average annual capital requirements over the 25-year projection period are approximately $422.6 million. The dominance of container vessels among liners will reduce the need for Federal subsidy. Table 70 contains estimates of capital requirements for the liner trade, segregated between public and private capital. Public sector funds come from CDS and the Defense Department's special features programs. (Defense feature costs are not shown explicitly because they are usually well under 1 percent of the commercial cost of a vessel.)

Capital formation in the container trades is not expected to be a major problem. Financing will likely be accomplished internally, from commercial sources, or through CDS, assuming continuation of the Federal Ship Financing Program loan guarantees and the Capital Construction Fund. Leasing is not expected to be essential to the success of container operations, but will likely be used for tax purposes. For companies using CDS, only about 55 percent of the commercial price must be financed. Of this, 75 percent (87.5 percent if CDS is not used) can be guaranteed under the Federal Ship Financing Program. The rest can usually be financed.

Despite the growth projected in U.S.-flag bulk trade, average annual capital requirements are only $83.26 million. Nevertheless, Table 71 projections appear highly optimistic and are contingent on substantial ODS and CDS subsidies. In 1978, two contracts for ten U.S.-flag dry-bulk vessels were accepted for construction at over 49 percent CDS.[163] More importantly, under the 1970 amendment to the Merchant Marine Act of 1936, bulk vessels are eligible for 100 percent of the operating differential, unlike the liner sector for which only 20 to 50 percent of the items are typically eligible for ODS. Federal loan guarantees, CDS, cargo preference, and ODS are assumed, with rare exception, to be the major factors which permit a U.S.-flag presence in the bulk trade. Many of these vessels are expected to be leased, chartered, or operated as part of a larger corporate structure which essentially guarantees cargo for at least the duration of the loan.

LNG ships are expected to be dedicated to given trades and constructed as part of specific LNG service projects. The projects themselves are highly contingent, however, and numerous factors could reduce requirements for the projected number of vessels. Most are expected to be financed under Title XI, but only about half are expected to apply for CDS because the average CDS has been only 21.3 percent of construction cost. The acceptance of CDS reduces Federal loan guarantees.[164] Seven U.S.-flag LNGs have been financed using only Title XI. Subsidies to build two LNG vessels in 1972 were returned to MarAd.[165] The projections of LNG capital requirements in Table 72 assumes only half of U.S.-flag LNGs will be built under CDS. A unit price of $100 to $150 million[166] would still mean a very substantial Federal contribution.

Table 73 summarizes capital requirements for the U.S.-flag merchant marine in U.S. foreign trade.

TABLE 70. Forecast of capital requirements by source, U.S.-flag liner sector, 1976 to 2000 (millions of 1975 $)

Source	Years 1976–1980	1981–1985	1986–1990	1991–1995	1996–2000
Private	746.9	706.7	829.4	1,302.9	2,225.3
Federal	611.1	578.3	678.6	1,066.1	1,820.7
Total	1,358.0	1,285.0	1,508.0	2,369.0	4,046.0

SOURCE: NTPSC forecasts.

TABLE 71. Forecast of capital requirements by source, U.S.-flag bulk sector, 1976 to 2000 (millions of 1975 $)

Source	Years 1976–1980	1981–1985	1986–1990	1991–1995	1996–2000
Private	211.7	145.2	206.2	287.1	293.2
Federal	173.3	118.8	168.8	234.9	239.8
Total	385.0	264.0	375.0	522.0	533.0

SOURCE: NTPSC forecasts.

TABLE 72. Forecast of capital requirements by source, U.S.-flag LNG vessels, 1976 to 2000 (millions of 1975 $)

Source	Years 1976–1980	1981–1985	1986–1990	1991–1995	1996–2000
Private	485.7	1,630.7	779.9	1,324.5	879.1
Federal	131.3	441.3	221.1	358.5	237.9
Total	617.0	2,072.0	991.0	1,683.0	1,117.0

SOURCE: NTPSC estimates.

Note: Includes CDS and Defense features.

PORTS, HARBORS, AND FACILITIES FOR INTERNATIONAL TRADE

Some of the capital required for ports, harbors and facilities is covered under the previous discussion of domestic water transportation. Other investment dedicated primarily to international trade is shown in Table 74. The figures in the table include capital requirements of most ocean ports.

Principal expenditures are for the offshore deep-water ports LOOP and the Texas Deepwater Port Authority project (which replaced SEADOCK). These two projects, costing approximately $1 billion each, are privately funded. Contingency plans call for guarantee of the bonds of the Texas project by the State of Texas.[167] Other projects include those of the Corps of Engineers, specifically identified as "deep draft," and U.S. Coast Guard capital allocations.

Table 75 summarizes all projected capital investment in domestic and international water transportation by scenario for the 1975 to 2000 period.

EMPLOYMENT

Despite the projected growth in domestic and international ocean vessels, employment is not expected to increase substantially. New technology, particularly the faster and more efficient container ships and larger vessels, has drastically reduced employment requirements. The projected transition of the U.S.-flag fleet to capital-intensive container ships further supports this conclusion. Even if the rather dramatic increase in U.S.-flag bulk fleet projections materializes, total employment would not be expected to increase substantially. Average crew sizes will gradually decline from break-bulk standards of 45, to 40 or less for a container vessel of comparable deadweight tons. This trend will be less evident in the domestic ocean trade, but substantial fleet replacement will provide for greater vessel operating efficiency.[168]

TABLE 73. Forecast of total capital requirements, U.S.-flag merchant marine in U.S.-foreign trade, medium growth scenario, 1976 to 2000 (millions of 1975 $)

Source	1976 to 1985	1986 to 2000	Total
Private	3,927	8,128	12,055
Federal	2,277	5,016	7,293
Total	6,204	13,144	19,348

SOURCE: NTPSC forecasts.

TABLE 74. Forecast of capital requirements for international marine ports, harbors and facilities, medium-growth scenario (millions of 1975 $)

Source of Capital	Years 1975 to 1985	1986 to 2000	Total
Federal	1,020	3,000	4,020
State and Local Government and Private	3,950	5,485	9,435
Total	4,970	8,485	13,455

SOURCE: NTPSC forecasts.

Continued growth is projected in the domestic marine trade. Great Lakes shipping is expected to continue its trend to larger, "post-Seaway" size vessels as older lakers are replaced. Inland river transportation will show the least reduction in employment-to-output ratios. Although the trend is to equipment of greater horsepower, the present combination of towboat horsepower and tow size is not expected to change significantly. Increased western coal traffic, both in the Great Lakes and inland rivers, will show the greatest tendency to utilize large lakers and maximum tow size. Appendix Table 54 shows projections of shipboard employment in domestic and international marine transportation for the period 1975 to 2000.

LOCAL PUBLIC TRANSIT

Local public transportation includes urban mass transit, commuter rail service, taxicab operations, and rural public transit. Expenditures for local public transportation have been heavily influenced by the Federal government. Except for taxicabs, most common carrier passenger service within large metropolitan areas is provided by public agencies heavily

TABLE 75. Forecast of total capital investment in water transportation (millions of 1975 $)

	Low-Growth Scenario			Medium-Growth Scenario			High-Growth Scenario		
	1976–1985	1986–2000	Total	1976–1985	1986–2000	Total	1976–1985	1985–2000	Total
Domestic Water									
Channels, Ports, Harbors, & Facilities:									
Federal:									
Existing System	820	1,950	2,770	820	1,950	2,770	820	1,950	2,770
Additions	1,830	3,520	5,350	1,830	3,520	5,350	1,830	3,520	5,350
State and Local Gov't and Private:									
Replacement	70	181	251	85	315	400	93	354	447
Expansion	156	298	454	190	520	710	209	585	794
Subtotal	2,876	5,949	8,825	2,925	6,305	9,230	2,952	6,409	9,361
Equipment (Private):									
Inland Waterways	4,239	6,937	11,176	5,170	12,090	17,260	5,677	13,604	19,281
Domestic Ocean	820	1,492	2,312	1,220	2,600	3,820	1,340	2,926	4,266
Great Lakes	738	1,480	2,218	900	2,580	3,480	988	2,903	3,891
Subtotal	5,797	9,909	15,706	7,290	17,270	24,560	8,005	19,433	27,483
Total	8,673	15,858	24,531	10,215	23,575	33,790	10,957	25,842	36,799
International Marine Transportation									
Ports, Harbors, & Facilities:									
Federal	1,160	2,400	3,560	1,160	2,400	3,560	1,160	2,400	3,560
State and Local Government and Private	3,107	3,654	6,761	3,950	5,485	9,435	4,196	7,369	11,565
Subtotal	4,267	6,054	10,321	5,110	7,885	12,995	5,356	9,769	15,125
Equipment:									
Federal	1,791	3,342	5,133	2,277	5,016	7,293	2,419	6,739	9,158
Private	3,089	5,415	8,504	3,927	8,128	12,055	4,172	10,920	15,092
Subtotal	4,880	8,757	13,637	6,204	13,144	19,348	6,591	17,659	24,250
Total	9,147	14,811	23,958	11,314	21,029	32,343	11,947	27,428	39,375

SOURCE: NTPSC forecasts.

subsidized by the Urban Mass Transportation Administration (UMTA). (Specialized, demand-responsive operations restricted to the elderly, handicapped, or other disadvantaged groups are not included in these analyses.)

While private ownership remains the rule in smaller cities and rural areas, the increasing availability of Federal assistance may result in a Federal presence throughout local public transportation. Federal participation in local public transportation is unique in its intent to induce rather than satisfy demand for service. Investment "needs" are determined largely by the amount Congress is willing to spend to entice people from their cars and to provide mobility for disadvantaged groups. Such goals as social welfare, community development, and environmental enhancement underlie Federal policy in this area.

NTPSC used the TRANS model described in Chapter 5 to forecast urban mass transportation investment. Table 76 shows the results. These investments do not include public operating subsidies, which will be discussed in Chapter 11.

Table 77 compares the NTPSC's figures with those of two other studies covering roughly similar time periods. The NTPSC forecast and that of *Trends and Choices*[169] are based on the same estimates of future transit facilities for individual urban areas. NTPSC's numbers, however, use different and more uniform unit costs. The American Association of State Highway and Transportation Officials figures came from a survey in 1978, but the reporting was incomplete.

Future levels of capital subsidy for transit paid by Federal, state, and local governments can be calculated. Given the current 80 percent share of most capital investments covered by the Federal government, calculations based on Table 76 suggest a total Federal investment of $128.9 billion between 1976 and 2000. Non-Federal public participation will total approximately $32.2 billion.

TABLE 76. Forecast capital investment in urban mass transportation, 1976 to 2000 (millions of 1975 $)[a]

Investment Category	1976 to 1985	1986 to 2000	Total
Fleet Replacements (Bus and Rail)	9,115	19,433	28,548
Expansion:			
Bus Fixed Facilities	3,087	4,978	8,065
Bus Fleet	1,047	1,153	2,200
Rail Fixed Facilities	37,114	71,542	110,656
Rail Fleet	4,398	7,712	12,110
Totals	54,761	104,818	161,579

SOURCE: TRANS 6 model runs by Peat, Marwick, Mitchell & Co. for the NTPSC. Inputs to the model included forecast highways and transit service reported by urbanized areas for the *1974 National Transportation Report.*

[a] Forecast the same for all scenarios.

Because Federal appropriations for transit have been authorized through FY 1982, NTPSC estimates for the period 1975 to 1980 provide a check on the reliability of predictions based on the TRANS model. The capital and operating subsidy requirements estimated by the NTPSC are approximately 22 percent higher on the average, suggesting that less subsidy is being provided than is predicted by the model. New appropriations are possible; and other sources such as the EPA Clean Air programs, revenue sharing, and the proposed emergency security fund could provide support. If medium-growth scenario estimates are reduced by 22 percent to reflect differences between actual authorizations and the amounts predicted by the TRANS model over the 1976 to 1980 period, total Federal capital assistance by the year 2000 will be about $100.5 billion.

TABLE 77. Comparison of urban mass transportation investment forecasts (millions of $)

Source	Period	Amount	Avg./Year
NTPSC	1975 to 1990 (1975 $)	89,995	5,999
Trends and Choices	1977 to 1990 (1975 $)	81,896	4,550
AASHTO	1977 to 1987 (1977 $)	43,000	4,300

SOURCES: NTPSC forecasts; U.S. Department of Transportation, Office of the Secretary, *National Transportation: Trends and Choices (to the year 2000),* Washington, D.C.: Government Printing Office, 1977; American Association of State Highway and Transportation Officials, communications with Clyde E. Pyers, Director, Division of Transportation Planning and Development, Washington, 1978.

TABLE 78. Forecast taxicab equipment costs, 1976 to 2000 (millions of 1975 $)

Year	Equipment		
	Expansion	Replacement	Total
1976–1980	36	840	876
1981–1990	91	1784	1875
1991–2000	97	1894	1991
Total	224	4518	4742

SOURCE: NTPSC forecasts.

Taxicab operations and other paratransit modes are not included in the TRANS model, though Federal assistance is available to promote the use of paratransit. In Table 78, capital trends and projections developed for the taxi industry in the 1972 *National Transportation Report* for 1972 through the 1980s are extended to the year 2000. The projection beyond 1990 is based on the growth rate for the period 1980 to 1990. This is not an unreasonable assumption if taxis are given an enlarged role in urban transportation reflecting the superior characteristics of their door-to-door services in low-density areas. Expenditures on taxicabs over the next quarter century are forecast to total $4.7 billion.

Unless current Federal laissez-faire policies toward the private taxicab industry are changed, the total investment projected in Table 78 must come from users. A DOT report published in 1972 documented a 21.3 percent increase in ridership from 1965 to 1970, during which time fares increased 28.4 percent.[170] In those five years, taxi fares rose less than fares for other public modes, but still kept ahead of increases in the consumer price index.

RURAL PUBLIC TRANSIT

Estimates for rural investment needs by the NTPSC are based on scenarios described in a paper presented to the Transportation Research Board.[171] Total projected expenditures, as shown in Table 79,

TABLE 79. Forecast capital investment in rural public transit, 1976 to 2000 (millions of 1975 $)

Year	Total
1976–1985	1,294
1986–2000	3,851
1976–2000	5,145

SOURCE: NTPSC estimates based on Jon Burkhardt *et al.,* "Impacts of Rural Transit Funding Options," paper presented at the 5th Annual Conference of the Transportation Research Board, Washington, D.C.: 1978.

can be expected to be about $5.1 billion for the period 1976 to 2000. If status quo policies are maintained, 80 percent of the total ($3.8 billion) would be paid by the Federal government.

THE TRANSPORTATION EQUIPMENT INDUSTRIES

The future capital needs discussed so far are for operating equipment such as automobiles, locomotives, trucks, ships, and accompanying infrastructure. Demand for the equipment, in turn, will create further demand for goods and services by the industries that supply the equipment manufacturers. Successive rounds of induced demand can be traced through the economy. Notice should be taken, therefore, of the capital requirements and capacity levels of the transportation equipment industry.

The Inforum model used by NTPSC in its forecasting was applied to assess the ability of industry to produce needed transportation equipment. Estimates were made for production increases implied for various industries by the expansion of activity and capital requirements forecast for transportation. The results were compared with the production capacities currently being used by the industries.

Estimates of capacity utilization in the transportation equipment industries were made in 1978 by the Bureau of Economic Analyses of the Department of Commerce.[172] The survey estimated capacity utilization and the ratio of actual to desired utilization under normal conditions.

The BEA survey indicated substantial unused capacity in manufacturing, with no trend to full utilization. This may reflect the oligopolistic nature of the transportation equipment industry and the resultant excess capacity built in anticipation of demand. However, the utilization ratio may also imply that the transportation equipment industries have additional capacity to meet sudden increases in demand for conventional equipment. The fact that the capacity utilization percentages have not approached 100 percent over the period 1965 to 1977 implies that, barring a significant change in market or industry structure, excess capacity can be expected to persist.

An examination of second-round capital goods producers, that is, those supplying the transport equipment industries, shows that bottlenecks are unlikely even if the expansion of transportation equipment supplies becomes necessary. The BEA has compiled tables describing the value of purchases of capital goods by 80 industries in 1963 and 1967. Although these tables are old, it is unlikely that these capital expenditure profiles have changed substantially (in relative terms). By far the largest expenditure on capital goods in the motor vehicles and equipment, aircraft and parts, and other transportation equipment sectors (amounting in either year to about 30 percent of dollar outlays by those sectors on capital expenditure) was for new structures.[173]

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171. Jon Burkhardt *et al.,* "Impacts of Rural Transit Funding Options," paper presented at the 57th Annual Conference of the Transportation Research Board, Washington, D.C.: National Academy of Sciences, January 1978.
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The Relative Price of Transportation to the Year 2000

11

INTRODUCTION

This chapter builds on the preceding chapters of this report that deal with forecasts to the year 2000. It concludes the presentation of the NTPSC forecasts by highlighting ways in which the relative use of resources by transportation is likely to change in the U.S. compared with the base year 1975.

A SET OF TRANSPORTATION ACCOUNTS

The concept of the U.S. "transportation bill" is used in this chapter. The bill is defined as the sum across all markets of: (1) the revenues of for-hire modes; (2) the annual costs (including capital) of private transportation; and (3) government subsidies to transportation (where government subsidies equal government's expenditures for each mode minus receipts from user charges). The transportation bill is only part of the cost of transportation to the nation. The time spent in movement by both people and goods has economic value. Further, transportation may create externalities, e.g., hazards, air pollution, or higher noise levels. (Such costs were discussed in Chapter 7 and are not covered further in this chapter.)

Table 80 contains data showing how the U.S. transportation bill is likely to grow in relation to gross national product (GNP) and population. Figures for government subsidies and the labor force have been included to illustrate relationships in per capita expenditures occurring over time.

Historically, the percent of resources used for transportation, as indicated by the ratio of the U.S. transportation bill to GNP, has been remarkably constant. The NTPSC forecasts that if the U.S. GNP rises in real terms to the year 2000, the percentage of resources devoted to transportation will most likely decline. From Table 80 it can be seen that under the medium-growth scenario, the transport bill per person will increase in 1975 dollars from the 1975 level of about $1,500 per capita to a little over $2,700 by 2000. The amount of government subsidy, as defined above, per labor force member is likewise expected to increase across scenarios and time periods if current practices are continued, from the 1975 level of $184 to $571 in 2000 for the medium-growth scenario. Note that estimates of the transportation bill include transportation's share (based on its consumption) of all the costs associated with fuel conversion as described in Chapter 8.

The freight and passenger bills are anticipated to grow at different rates. The growth in intercity ton-miles per capita is due in part to efforts to achieve energy independence. The development of domestic energy resources, such as coal, will lead to increased domestic ton-miles but decreased international import tonnages. The ratio of the passenger bill to disposable income is forecast to decrease from 17.69 percent in 1975 to 13.2 percent in 2000 under the medium-growth scenario.

Table 81 shows the changing shares of the transportation bill incurred by the U.S. international, intercity, and local transportation markets. In general, with increasing affluence over time or between scenarios, the longer-haul international and intercity markets will increase their shares.

Changes in unit costs (or average prices) used in calculating the transportation bill are derived from four basic sources. First are changes in the composition of transportation activity. For example, increased costs per ton-mile by truck may result from carrying a greater percent of light, high-value commodities which cost more to haul per unit. Second, changes in the costs of material inputs and value-added components of cost (wages, interest, rents, and profits) may push up ton-mile costs.[1] A third source of cost data is estimates of increased fuel expense. Oil and gas prices tend to be administered either by major foreign suppliers or by U.S. government regulation, although some end-use products (e.g., aviation fuel) are not regulated, and others are scheduled to be deregulated. The longer-term fuel prices presented in Chapter 8 were developed under the assumption that foreign fuel prices will not exceed the costs to the U.S. of substitutes for foreign oil, and further that domestic oil prices will be allowed to rise to a level where domestic substitutes

TABLE 80. Transportation bill comparisons forecast by scenario, 1975 to 2000

	Base Year	Low-Growth Scenario		Medium-Growth Scenario		High-Growth Scenario	
	1975	1985	2000	1985	2000	1985	2000
GNP (billions of 1975 $)	1529	2034	2342	2276	3588	2418	4474
Population (millions)	214	229	246	233	260	229	246
Labor Force (millions)	95	105	117	109	124	110	124
Transportation Bill (billions 1975 $)	323.0	447.9	564.6	485.0	709.0	504.0	847.6
Trans. Bill/GNP %	21.1	22.0	24.1	21.3	19.8	20.8	18.9
Trans. Bill/Capita (1975 $)	1509	2093	2295	2082	2727	2201	3446
Government Subsidy (billions 1975 $)	17.4	42.1	68.9	42.8	70.8	42.8	72.8
Government Subsidy/Capita (1975 $/person)	81	184	280	184	272	187	296
Subsidy/Labor Force (1975 $)	183	401	589	393	571	389	587
Subsidy/Trans. Bill %	5.4	9.4	12.2	8.8	10.0	8.5	8.6
Freight Bill/Trans. Bill[a] %	39.3	41.5	41.4	44.8	50.9	46.2	53.2
Pass. Bill/Trans. Bill[a] %	59.4	57.2	57.2	53.8	47.5	53.3	45.2
Freight Bill/Capita (1975 $)	593	813	950	933	1389	1017	1834
Pass. Bill/Capita (1975 $)	896	1119	1314	1120	1296	1175	1556
Pass. Bill/Capita % Dispos. Inc/Capita	17.6	18.1	19.6	16.3	13.2	15.8	11.9

SOURCE: Sources stated in tables in the remainder of the chapter, summarized here by the NTPSC.

[a] Passenger plus freight numbers do not equal 100 percent because of a separate miscellaneous category.

are competitive. Anticipated fuel price increases have already motivated conservation. However, the potential for fuel savings varies from mode to mode. The NTPSC estimated the effects of changes in fuel use and fuel price increases on costs of service for each major mode.

The final potential source of unit cost changes is taxes and user charges imposed by governments. The government-account information discussed in the next section of this chapter suggests how user-charge revenues will fall short of covering government expenditures for each mode if current practices continue. The amount of shortfall can be employed to calculate how much costs might increase if user charges rose to cover government expenditures.

TABLE 81. Forecast market shares of the U.S. transportation bill, 1975 to 2000 (percentages)

Transport Markets	Base Year	Low-Growth Scenario		Medium-Growth Scenario		High-Growth Scenario	
	1975	1985	2000	1985	2000	1985	2000
International	3.1	3.0	3.4	3.7	4.6	4.0	5.9
Domestic							
Intercity	52.2	53.4	54.0	55.1	55.7	55.4	56.8
Local	43.4	42.2	41.2	39.8	38.1	39.2	35.7
Miscellaneous[a]	1.3	1.4	1.4	1.4	1.6	1.4	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: NTPSC forecasts.

[a] See section on miscellaneous items for definitions.

SUMMARIES BY MODE

Table 82 displays the transportation bill calculated by the NTPSC. The tabular material is presented by scenario and for each scenario, by market and major transport mode. For each market, revenues of for-hire carriers and expenditures of private owner-operators are totaled. A government column is shown, calculated by summing government expenditures and subtracting user impost revenues.

The specific definitions used in this chapter are set forth in Appendix Table 55 and differ somewhat from those used in Chapters 9 and 10. Here, the definitions generally include revenues accruing to U.S. carriers and, excepting air freight, include U.S. purchases of transport services from foreign carriers.

THE U.S. INTERNATIONAL BILL

In general the international bill forecasts suggest that the U.S. share of each market for each commodity and for passengers will not change. However, such unforeseen political actions as international agreements or different cargo preference laws would cause substantial change, as could wars and

TABLE 82 (Part A). Elements of the transportation bill by market for 1975, 1985 and 2000, low-growth scenario (millions of 1975 $)

	1975			1985			2000		
Market	Revenues and Private Expenditures	Subsidy by Governments	Total Transportation Bill	Revenues and Private Expenditures	Government Subsidy—User Charge Deficit	Total Transportation Bill	Revenues and Private Expenditures	Government Subsidy—User Charge Deficit	Total Transportation Bill
U.S. International	9419	892	10311	12597	996	13593	17907	1189	19096
Freight	5693	829	6522	6494	921	7415	10078	1088	11166
Water	4928	761	5689	4906	868	5774	7527	1017	8544
Air	765	68	833	1588	53	1641	2551	71	2622
Passenger	3726	63	3789	6103	75	6178	7829	101	7930
Air	3445	62	3507	5789	74	5863	7503	100	7603
Water	281	1	282	314	1	315	326	1	327
Intercity	159137	8756	167893	216171	22856	239027	267077	37906	304983
Freight	69517	2962	72479	108121	8665	116785	136465	14641	151106
Truck	47272	1667	48939	67282	7474	74756	92550	13045	105595
Reg. Tr.	22000	NA	NA	NA	NA	NA	NA	NA	NA
Other	25272	NA	NA	NA	NA	NA	NA	NA	NA
Rail	16509	282	16791	27331	216	27547	28762	216	28978
Water	2434	768	3202	4261	817	5078	2868	1074	3942
Dom. Ocean	1136	NA	NA	NA	NA	NA	NA	NA	NA
IWW	950	NA	NA	NA	NA	NA	NA	NA	NA
Gt. Lakes	348	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline	2229	26	2255	7689	26	7715	10324	26	10350
Oil	1317	NA	NA	3227	NA	NA	5862	NA	NA
Gas	912	NA	NA	4462	NA	NA	4462	NA	NA
Aviation	1073	219	1292	1558	132	1690	1961	280	2241
Passenger	89620	5794	95414	108050	14191	122241	130612	23265	153877
Auto[a]	71933	4361	76294	81929	12864	94793	88823	20620	109443
Aviation	16315	1115	17430	24465	488	24953	39684	1487	41171
Carriers	11581	NA	NA	14455	NA	NA	18942	NA	NA
General	4734	NA	NA	10010	NA	NA	20742	NA	NA
Rail	340	308	648	418	681	1099	468	979	1447
Bus	1016	0	1016	1220	141	1361	1614	141	1755
Water	16	10	26	18	17	35	23	38	61
Local	133008	7532	140540	171214	18030	189244	203215	29610	232825
Freight, Truck	47790	209	47999	60554	962	61516	70394	1077	71471
Passenger	85218	7323	92541	110660	17068	127728	132821	28533	161354
Auto	82732	3397	86129	107188	10105	177293	128771	16282	145053
Own. Op[a]	81150	NA	NA	104455	NA	NA	126027	NA	NA
Taxi	1582	NA	NA	2733	NA	NA	2744	NA	NA
Transit	2200	2038	4238	3018	4296	7314	3330	7709	11039
Bus	600	NA	NA	NA	NA	NA	NA	NA	NA
Rail	1401	NA	NA	NA	NA	NA	NA	NA	NA
Commuter	199	NA	NA	NA	NA	NA	NA	NA	NA
Other	0	NA	NA	NA	NA	NA	NA	NA	NA
School Bus	286	1888	2174	454	2667	3121	720	4542	5262
Misc.	3973	263	4236	5784	263	6047	7385	263	7648
Boats	1754	263	2017	2206	263	2469	3244	263	35073
Recreation	NA	NA	NA	NA	NA	NA	NA	NA	NA
Com. Fish	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other	2219	0	2219	3578	NA	NA	4141	NA	NA
Total	305537	17443	322980	405766	42145	447911	495584	68968	564552

SOURCE: NTPSC forecasts.

NOTE: NA stands for "not available." In some cases the values were estimated to be too small to be computed in detail. In general, the higher level subtotals and totals include the full subsidy values.

[a] Automobiles and user operated small trucks.

[b] Taxis and limousines driven for hire.

TABLE 82 (Part B). **Elements of the transportation bill for 1975, 1985, and 2000, medium-growth scenario (millions of 1975 $)**

Market	1975			1985			2000		
	Revenues and Private Expenditures	Subsidy by Governments	Total Transportation Bill	Revenues and Private Expenditures	Government Subsidy—User Charge Deficit	Total Transportation Bill	Revenues and Private Expenditures	Government Subsidy—User Charge Deficit	Total Transportation Bill
U.S. International	9419	864	10283	16957	1049	18006	31557	1232	32789
Freight	5693	829	6522	9608	972	10580	17064	1161	18225
Water	4928	761	5689	7574	917	8491	11088	1111	12199
Air	765	68	833	2034	55	2089	5976	50	6026
Passenger	3726	35	3789	7349	77	7426	14493	71	14564
Air	3445	34	3507	7001	76	7077	14013	70	14083
Water	281	1	282	348	1	349	480	1	481
Intercity	159137	8756	167893	243211	23956	267167	355057	39571	394628
Freight	69517	2962	72479	130862	8812	139674	216971	15154	232125
Truck	47272	1667	48939	84223	7588	91811	140129	13689	153818
Reg.	22000	NA	NA	NA	NA	NA	NA	NA	NA
Other	25272	NA	NA	NA	NA	NA	NA	NA	NA
Rail	16509	282	16791	32007	216	32223	48804	216	49020
Water	2434	768	3202	4802	821	5623	9602	1079	10681
Dom. Ocean	1136	NA	NA	NA	NA	NA	NA	NA	NA
IWW	950	NA	NA	NA	NA	NA	NA	NA	NA
Gt. Lakes	348	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline	2229	26	2255	8072	26	8098	15263	26	15289
Oil	1317	NA	NA	NA	NA	NA	NA	NA	NA
Gas	912	NA	NA	NA	NA	NA	NA	NA	NA
Aviation	1073	219	1292	1758	161	1919	3173	144	3317
Passenger	89620	5794	95414	112349	15144	127493	138086	24417	162503
Auto[a]	71933	4361	76294	82568	13066	95634	80159	21769	101928
Aviation	16315	1115	17430	27968	1239	29207	55490	1490	56980
Carriers	11581	NA	NA	17459	NA	NA	34726	NA	NA
General	4734	NA	NA	10509	NA	NA	20764	NA	NA
Rail	340	308	648	454	681	1135	424	979	1403
Bus	1016	0	1016	1339	141	1480	1984	141	2125
Water	16	10	26	20	17	37	29	38	67
Local	133008	7532	140540	175743	17552	193295	240887	29759	270646
Freight, Truck	47790	209	47999	66209	970	67179	108366	1840	110206
Passenger	85218	7323	92541	109534	16582	126116	132021	27919	159940
Auto	82732	3397	86129	106619	10225	116844	128330	17110	145440
Own. Op[a]	81150	NA	NA	104323	NA	NA	124295	NA	NA
Taxi	1582	NA	NA	2296	NA	NA	4035	NA	NA
Transit	2200	2038	4238	2450	3690	6140	2852	6267	9119
Bus	600	NA	NA	675	NA	NA	791	NA	NA
Rail	1401	NA	NA	1580	NA	NA	1846	NA	NA
Commuter	199	NA	NA	195	NA	NA	215	NA	NA
Other	0	NA	NA	NA	NA	NA	NA	NA	NA
School Bus	286	1888	2174	465	2667	3132	839	4542	5381
Misc.	3973	263	4236	6301	263	6564	10800	263	11063
Boats	1754	263	2017	2573	263	2836	4454	263	4717
Recreation	NA	NA	NA	NA	NA	NA	NA	NA	NA
Com. Fish	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other	2219	0	2219	3728	NA	NA	6346	NA	6346
Grand Total	305537	17443	322980	442212	42820	485032	638301	70825	709126

SOURCE: NTPSC forecasts.

NOTE: NA stands for "not available." In some cases the values were estimated to be too small to be computed in detail. In general, the higher level subtotals and totals include the full subsidy values.

[a] Automobiles and user operated small trucks.

[b] Taxis and limousines driven for hire.

TABLE 82 (Part C). Elements of the transportation bill for 1975, 1985, and 2000, high-growth scenario (millions of 1975 $)

	1975			1985			2000		
Market	Revenues and Private Expenditures	Subsidy by Governments	Total Transportation Bill	Revenues and Private Expenditures	Government Subsidy—User Charge Deficit	Total Transportation Bill	Revenues and Private Expenditures	Government Subsidy—User Charge Deficit	Total Transportation Bill
U.S. International	9419	892	10311	102832	19148	20239	48391	1443	49834
Freight	5693	829	6522	10812	1015	11827	27060	1380	28440
Water	4928	761	5689	8356	962	9318	16717	1362	18079
Air	765	68	833	2456	53	2509	10343	18	10361
Passenger	3726	63	3789	8336	76	8412	21331	63	21394
Air	3445	62	3507	7959	75	8034	20693	62	20755
Water	281	1	282	377	1	378	638	1	639
Intercity	159137	8756	167893	258686	23381	282067	442576	39288	481864
Freight	69517	2962	72479	141238	8841	150079	269999	15525	285524
Truck	47272	1667	48939	89078	7645	96723	172567	14145	186712
Reg.	22000	NA	NA	NA	NA	NA	NA	NA	NA
Other	25272	NA	NA	NA	NA	NA	NA	NA	NA
Rail	16509	282	16791	36429	216	36645	64981	216	65197
Water	2434	768	3202	5087	819	5906	10906	1076	11982
Dom. Ocean	1136	NA	NA	NA	NA	NA	NA	NA	NA
IWW	950	NA	NA	NA	NA	NA	NA	NA	NA
Gt. Lakes	348	NA	NA	NA	NA	NA	NA	NA	NA
Pipeline	2229	26	2255	8711	26	8737	17607	26	17633
Oil	1317	NA	NA	4101	NA	NA	10907	NA	NA
Gas	912	NA	NA	4610	NA	NA	6700	NA	NA
Aviation	1073	219	1292	1933	135	2068	3938	62	4000
Passenger	89620	5794	95414	117448	14540	131988	172577	23763	196340
Auto[a]	71933	4361	76294	84608	13193	97801	98167	22587	120754
Aviation	16315	1115	17430	30895	508	31403	71534	18	71552
Carriers	11581	NA	NA	20127	NA	NA	47899	NA	NA
General	4734	NA	NA	10768	NA	NA	23635	NA	NA
Rail	340	308	648	470	681	1151	695	979	1674
Bus	1016	0	1016	1454	141	1595	2149	141	2290
Water	16	10	26	21	17	38	32	38	70
Local	133008	7532	140540	181472	18102	199574	270610	31807	302417
Freight, Truck	47790	209	47999	70210	785	70995	135435	1820	137255
Passenger	85218	7323	92541	111262	17317	128579	135175	29987	165162
Auto	82732	3397	86129	107737	10371	118108	131053	17759	148812
Own. Op[a]	81150	NA	NA	105004	NA	NA	125161	NA	NA
Taxi	1582	NA	NA	2733	NA	NA	5892	NA	NA
Transit	2200	2038	4238	3071	4279	7350	3402	7686	11088
Bus	600	NA	NA	NA	NA	NA	NA	NA	NA
Rail	1401	NA	NA	NA	NA	NA	NA	NA	NA
Commuter	199	NA	NA	NA	NA	NA	NA	NA	NA
Other	0	NA	NA	NA	NA	NA	NA	NA	NA
School Bus	286	1888	2174	454	2667	3121	720	4542	5262
Misc.	3973	263	4236	6699	263	6962	13249	263	13512
Boats	1754	263	2017	2664	263	2927	5081	263	5344
Recreation	NA	NA	NA	NA	NA	NA	NA	NA	NA
Com. Fish	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other	2219	0	2219	4035	NA	NA	8168	NA	8168
Grand Total	305537	17443	322980	466005	42837	508842	774826	72801	847627

SOURCE: NTPSC forecasts.

NOTE: NA stands for "not available." In some cases the values were estimated to be too small to be computed in detail. In general, the higher level subtotals and totals include the full subsidy values.

[a] Automobiles and user operated small trucks.

[b] Taxis and limousines driven for hire.

changed foreign or U.S. economic conditions. Following are discussions of each transport market and mode.

U. S. International Marine Bill

NTPSC forecasts indicate the U.S. international marine bill may grow at a rate comparable to or slightly exceeding the growth in real GNP during the 1975 to 1985 period, and slightly less than real GNP from 1985 through 2000.

Shipping rates in the liner trade (the liner trade is only a portion of U.S. trade) are established by conferences. A conference agreement is defined by the Federal Maritime Commission (FMC) as an agreement among ocean carriers which will or could reasonably be expected to cause the parties to become a dominant force in the trade.[2] Usual attributes of conferences are the collective establishment of uniform rates, charges and practices relating to the receipt, carriage, and delivery of cargo by all members of the conference, the filing of a common tariff and the designation of a conference administration.[3] Independent operators can, and typically do, publish rates below conference rates.[4]

This system of open conference rate setting is permitted under Section 15 of the 1916 Shipping Act, which has in large part exempted liner shipping from the operation of the antitrust laws.[5] The FMC, as part of its regulatory jurisdiction over domestic offshore commerce, considers the "fairness" of ocean freight rates and the competitive practices of carriers.[6] Although the FMC must approve all liner rates in U.S. foreign trade, it can disapprove rates only if they are "so unreasonably high or low as to be detrimental to the commerce of the United States." Also, U.S. carriers are not permitted to be members of closed conferences, as are their foreign competitors.[7] This prohibition limits the control of rates by conferences and prevents limitation of entry in U.S. foreign trade. Thus, the prices, rates, and revenue of U.S.-flag carriers are significantly influenced by competitive factors outside their control or that of the U.S. government.

Rate structures in the liner trades have largely been demand based, according to "value of service." As a result, many commodities move at rates different than their individual share of fully distributed costs of carriage.[8]

High utilization is a basic criterion for profitability in the liner trade. Profits can accrue if a ship operates slightly above its break-even point.[9] This is particularly true for capital-intensive vessels such as container ships and barge carriers. Chapter 10 projected the evolution of a highly capital-intensive U.S.-flag fleet between 1975 and 2000.

Port handling costs provide an opportunity for improvement; however, many gains in productivity have already been realized in this sector. Based on MarAd estimates of International Longshoreman Association (ILA) workforce size and total cargo tonnage handled (excluding bulk and transhipments), labor productivity increased from a 1967 base of 100 to a 1975 comparative index of 150.[10] Here too, high capital cost (of container cranes at approximately $2 million each) tends to require high-volume capacity utilization. Port charges may, in fact, have to be increased in order to meet costs. Few public ports make a profit, and they often are subsidized for the purpose of attracting industry.[11] Port management, however, is becoming attuned to the objective of revenue financing.[12]

The government subsidies shown in Table 82 for U.S. International Marine Transportation will be covered in detail in the "Government Accounts" section of this chapter. In general, the subsidies consist of MarAd operating and construction differential subsidies and the share of U.S. Corps of Engineers and U.S. Coast Guard expenses allocable to U.S. international ocean movements. Not included are estimates of value to U.S.-flag shipping that accrue from various forms of cargo preference.

U.S. International Aviation Bill

The U.S. International Aviation bill is expected to grow much faster than real GNP. Route authorities for scheduled carriers in the international market are gained as a result of bilateral agreements between governments. Authorities to serve the routes are awarded to U.S. carriers by the Civil Aeronautics Board upon proof that the carrier is financially fit. The President may disapprove certification of a carrier to engage in foreign air transportation on grounds of foreign relations or national defense considerations.[13] In general, charter rights are separately treated.

Traditionally, both international passenger and air cargo rates have been established by carriers at meetings of the International Air Transport Association (IATA). U.S. carriers have participated in IATA rate-making sessions through CAB-approved agreements which grant the carriers antitrust immunity. However, all IATA rates have been subject to CAB approval.[14]

Studies of the international fare structure have concluded that IATA promoted inefficiency, stifled traffic growth, and caused higher fares than justified by costs.[15] These studies provided impetus for recent revisions of CAB policy to stress competition. The CAB has approved applications for low-fare flights from U.S. cities to destinations abroad. In addition, the agency tentatively has decided to withdraw its approval of IATA ratemaking agreements.[16] If this decision becomes final, U.S. air carriers would not be able to participate in IATA ratemaking deliberations. The legality of participation in IATA ratemaking is moot to some carriers which have already left the organization to meet the competition of low-fare flights.

A greater percentage of passengers taking advantage of discount rates has meant that the yield—the amount per mile paid by each passenger—has declined. As the breakeven load factor rises close to the ceiling of available capacity due to a decrease in yields, the airlines have been devising fare structures to attract both full-fare and discount passengers as well as return sufficient profits to enable capital replacement and expanded service.

The future of international air cargo rates is unclear. At this point, all carriers have continued to follow the rates set by IATA and no significant rate changes have occurred in any markets. The air cargo market is developing rapidly, and has not experienced overcapacity problems.

With the introduction of price competition, improvement in overall efficiency is predicted, even when allowance is made for increased fuel costs. However, rates may not fully reflect the reduced costs. Aviation is a field which has been inextricably linked by many nations with prestige and national defense considerations. Most foreign air carriers are government-owned entities whose primary purpose may not be profitmaking.

U.S. subsidies to international aviation consist of an allocable share of Federal assistance to airports and airways, NASA aeronautics research, and costs of the National Oceanographic and Atmospheric Administration.

INTERCITY TRANSPORTATION BILL

Definitions used for the intercity market are shown in Appendix Table 56.

Motor Carriage

Motor carriage accounted for the major portion of the intercity freight bill in 1975. Forecasts indicate trucking's share will decline slightly by 1985, but it will retain its dominant position through the year 2000. The decreased share will be due to the larger growth forecast in domestic (as contrasted to U.S. international) movements of energy products compared to other products.

The distinction between regulated and private motor carriage is due in large part to government categorization. Federal regulatory change now being considered by Congress could weaken, redefine, or even eliminate the distinction. Thus a comparison of the rates of growth of the two categories could be misleading.

The NTPSC estimated the potential increase in fuel prices as a percent of truck revenues. Fuel price rises are expected to outrun any gains in fuel efficiency. The increase amounts to roughly one percent of expected 1985 revenues and three percent of year 2000 revenues (in constant 1975 dollars). NTPSC forecasts indicate gains in trucking productivity may not be sufficient to overcome increases in the cost of resources going into trucking (in addition to fuel prices), causing an increased cost per ton-mile of five percent by 1985, continuing to the year 2000.

The government subsidy to trucking derives largely from attributing to trucking a share of the general and property tax revenues (Federal, state, and local) used to pay a share of the cost of highways, highway patrol and related items.

Rail Freight

A unique consideration is involved in estimates of the rail freight bill—particularly the division between the market and government share. Rail activity is expected to increase sharply. However, for more than a decade the rail industry (see Chapter 10) had a relatively low return on equity compared to other industries. For this and perhaps other reasons, there has been an apparent deterioration of rail plant in some regions. The U.S. DOT and others have estimated that the industry as it now operates cannot raise the funds needed to bring its plant up to proper standards.[17] The question is who will pay for desired improvements—government or industry. For purposes of the transportation bill accounts in this chapter, it was assumed that funds would come from the rail industry. This assumption was incorporated in the forecasts in the following way: DOT projected a 1976 to 1985 shortfall of 7 percent of rail revenues over that time period, were the amount of deferred maintenance to be reduced by 50 percent.[18] Thus, the NTPSC's forecast rail revenues based on activity increases were raised 7 percent for 1985, to provide for a 50 percent reduction in deferred maintenance.

Assuming that the last 50 percent of deferred maintenance costs roughly the same as the first 50 percent, and takes another ten years to remove, the comparable percent of revenues for the 1985 to 2000 time period would be about 2.8 percent, given increased revenues. Therefore, the NTPSC revenue forecast based on activity for the year 2000 was increased by 2.8 percent to cover the remaining 50 percent of deferred maintenance.

Gains in rail energy efficiency are not expected to keep pace with increasing fuel prices. Consequently, rail costs may be forced up by as much as 4 percent by the year 2000 (medium-growth scenario) due to fuel price increases.

Coal, a relatively low-value commodity with fairly long hauls, is anticipated to account for much of the gain in rail ton-mileage. This should have a downward effect on average revenue per ton-mile hauled (although, due to coal traffic increases, average ton-mile costs of haulage may fall as well).

In addition to the above effects on ton-mile costs, the NTPSC forecasts increases in rail unit costs amounting to an additional 4 percent increase in rail cost per ton-mile in 1985 over the 1975 level. This figure drops to 2.5 percent by the year 2000.

Table 83 summarizes expected changes in rail cost per ton-mile.

Waterborne Freight

U.S. intercity waterborne freight movements fall into three general categories: domestic ocean; inland waterways; and Great Lakes. Each has different characteristics.

The Inforum model used by the NTPSC does not distinguish between the various categories of domestic intercity water transport. It does, however, indicate how costs for the sum of all three categories may change, forecasting a 12.7 percent increase in constant dollar cost per ton-mile hauled by 1985 and a 19.1 percent increase by 2000. Inforum does not account for the full increases in fuel costs expected. These would likely add several more percentage points (3 to 4) to constant dollar costs per ton-mile by the year 2000.

DOMESTIC OCEAN

Domestic ocean trade has coastal and non-contiguous categories. The coastal category generally involves ocean trade between points in the contiguous 48 states. The non-contiguous category involves domestic trade with Hawaii, Alaska, Puerto Rico and the Virgin Islands. Over 75 percent of domestic ocean trade is carried in self-propelled vessels. In terms of tonnage carried, petroleum dominates, accounting in 1974 for some 77 percent of the total.[19] About 76 percent of domestic ocean petroleum tonnage is coastal.[20] Changes in the patterns of energy use may thus substantially affect domestic ocean trade. Chapter 10 shows substantial increases in Alaskan oil shipments by domestic ocean trade are projected, accounting for much of the future capital needed.

TABLE 83. Forecast changes in railroad costs, by influencing factor, 1985 and 2000 (1975 $)[a]

Influencing Factor	Percent Change 1985 from 1975	Percent Change 2000 from 1975
Capital Need[a] (over and above present industry capability)	+7.0	+2.8
Fuel Prices[b]	+5.0	+4.0
Value added and Materials[c]	+4.0	+2.5
Total	+16.0	+9.3

[a]U.S. Department of Transportation estimate

[b]NTPSC energy model

[c]Inforum outputs

There appear to be few direct Federal subsidies to domestic ocean trade. However, some share of Corps of Engineers port and harbor expenses and U.S. Coast Guard activities associated with ports, coastal policing, and research and rescue appear reasonably allocable to this sector.

GREAT LAKES

The five Great Lakes, their connecting locks and channels, and the St. Lawrence River form a waterway system extending 2,342 miles from the western end of Lake Superior to the Atlantic which competes for cargo with parallel overland routes. Some of the key elements of the system are U.S.-owned, some Canadian (such as the Welland Canal), and some joint (the St. Lawrence Seaway). Channel depth and length of the locks limit the size of the vessels which may use the entire system. The Great Lakes are typically open to navigation 9 months of the year. Due to ice, the Seaway is usually closed from late December until early April. Both U.S. Coast Guard and Canadian icebreakers assist shipping at the beginning and end of the season. Contracts have been let to increase the carriage of coal from western coal fields, via the Great Lakes, to points on the Lakes. This, in addition to growth in the haulage of other commodities, is expected to cause Great Lakes traffic to reverse its generally downward trend.

Revenues from the Seaway generally cover operating and maintenance costs, but the initial capital costs may take an extremely long time to recover. U.S. Coast Guard activities, the operation of aids for navigation, research, and rescue are subsidized from Federal general tax revenues.

INLAND WATERWAYS

The inland waterways of the U.S. (except for the St. Lawrence Seaway) are developed, operated and maintained by the U.S. government, primarily under the auspices of the Army Corps of Engineers. Other Federal entities also contribute to the maintenance and operation of this system; these include the Coast Guard and the Tennessee Valley Authority.

The passage of P.L. 95–502 in 1978 provided for a fuel charge to be levied on the inland waterways (not including the Great Lakes and domestic ocean trades).[21] Although the present waterway user charge is not based on cost recovery, the constantly increasing expenses of waterway construction, operation, and maintenance need to be recognized in assessing the cost of future transportation by water. The cost to operate and maintain the current system is increasing. As new components are added to the system, the mileage needing future maintenance is increased as well. If full-cost recovery is to be considered as a policy option, there must be tradeoffs between annual maintenance of the existing system ($494 million in 1978), improvement of the existing system (e.g., Locks and Dam 26 at $432 million with no marginal increase to operations and maintenance) and new waterways (such as the Trinity River, at a first cost of $2.3 billion which is authorized but not started and which would marginally increase the costs of operations and maintenance).[22]

Inland water transport offers low costs to shippers with access to the waterways. (An example of unit operating cost is given in Appendix Table 57. Fuel and wages are the largest cost components.) Most products shipped by water are bulk commodities such as petroleum, coal, and grain. The industry depends upon long-hauls and large unit volumes, rather than high-value cargo.

About eight percent of all traffic handled by inland and intercoastal water carriers is subject to ICC regulation.[23] Many water carriers can respond rapidly to changes in their operating cost and adjust prices at peak periods or during times of low demand. This allows for efficient equipment utilization and permits higher prices when equipment is scarce. The unregulated competition of barges is of concern to the railroads, which are regulated and less able to change prices seasonally.

Return on investment in the inland water industry has generally been adequate to permit financing of vessel operations through retained earnings or traditional commercial sources. However, operating and new equipment cost have increased dramatically. Table 84 contains return on investment and return on equity data for a cross-section of the industry and includes both regulated and unregulated carriers.

TABLE 84. Financial performance indicators for inland waterway operators, 1972 to 1978

Year	ROI (WFB Carriers)	ROE (WFB Carriers)
1972	8.9	14.3
1973	6.9	9.7
1974	8.3	12.4
1975	6.6	9.3
1976	7.3	10.6
1977	5.1	6.3
1978[a]	4.3	4.2

SOURCE: ICC Suspension Board Case No. 68652.

[a] 6–month period ending June 30,1978 determined from latest available figures.

KEY: ROE = Return on equity.
ROI = Return on investment.
WFB = Waterway Freight Bureau.

Environmental protection legislation has been charged with driving up insurance costs significantly.[24] Another factor, higher fuel costs, now represents about 16 percent of total operating cost. (See Appendix Table 57.) Further, severe winters in 1976 and 1977 shortened the operating season on the Upper Mississippi and Illinois Rivers. These factors interacted to reduce operating profits below those of more prosperous times. Yet the industry appears viable and prices are not expected to increase substantially except in response to increased fuel cost and user charges.

The recently enacted inland waterway user charges are forecast to cover a small part of the Federal expenditures attributable to navigation on the inland waterways. Continuation of current practices thus results in substantial Federal subsidy.

Pipelines

The growth in revenues and activity forecast for pipelines tends to obscure the fact that large capital investments are being made due to the changes in origin-destination patterns described in Chapter 10. Recovery of this investment is expected to be reflected in charges made by the pipelines.

NTPSC forecasts oil and gas pipelines costs to increase by 42 percent (in 1975 dollars) to 1985 and 69 percent by 2000. By comparison, the Pace Company of Houston shows trunk pipeline costs per ton-mile between 1975 and 1990 increasing 75 percent for crude oil, and 34 percent for gas.[25] The only general government costs attributed to pipelines are an allocable share of the costs to regulate transportation.

Airlines

U.S. airlines are in transition from a highly regulated economic environment to one that is much less regulated. Deregulation has had the effect of spurring competition, reducing prices, providing more price-service options and promoting efficient operation. Both passenger and freight services are involved. During the 1960s, conversion to jet aircraft with their increased size and speed resulted in great productivity improvement. Opportunities for increasing speed and size will be more limited in the future.

Productivity improvements are thus expected to come from improvements in other types of vehicle efficiency, as discussed in Chapter 6.

Based on historic cost and productivity trends of expected inputs to the industry, the NTPSC forecasts that real airline costs per passenger-mile will continue to decline. A 6 percent decline from 1975 is expected by 1985, and 12 percent by the year 2000.

Countering these reductions will be fuel cost increases. Chapter 6 described possible airline fuel efficiency gains by the year 2000 of 32 to 40 percent. However, the cost of jet fuel is expected to increase 51 percent in constant dollars during the same period. Rising fuel costs will increase the air passenger transportation bill by 2.8 percent by 1985 and 6.4 percent by the year 2000. These two independent effects result in decreased costs per unit of service of 3.2 percent by 1985 and 5.6 percent by 2000.

The government account indicates that in 1978 airlines are expected to pay about 88 percent of attributable Federal aviation costs. If present Federal user charge practices continue, and the air-carrier growth forecast by the NTPSC materializes (per medium-growth scenario), by 1987 air carriers would pay 103 percent of costs.

General Aviation

General aviation is changing in fleet composition and growing rapidly. The Federal Aviation Administration (FAA) forecasts that general aviation hours by aircraft type will increase as shown in Table 85. Piston aircraft will continue to fly the preponderance of general aviation hours in future years.

Table 86 presents a slightly different perspective. It shows the ratio of hours expected to be flown in 1990 divided by the 1975 hours for each aircraft type. Multi-engine piston aircraft activity is expected to grow faster than that of single-engine piston aircraft, turbo-prop jet activity will exceed that of piston aircraft activity, while jets will have the great-greatest percentage increase.

Table 87 shows general aviation fuel consumption forecasts. Using statistics from Tables 85 and 87, plus the fuel price increases forecast by the NTPSC, an increase in general aviation costs per hour flown due to fuel cost increases can be calculated. This amounts to approximately 11 percent higher cost per hour flown by 1985 and 16 percent higher by 2000 compared with the constant 1975 dollar cost per aircraft hour.

Higher Federal user charges could also increase general aviation costs. A recent FAA cost allocation study showed that general aviation now pays about 14 to 25 percent of FAA expenses attributed to general aviation, but this percentage is decreasing.[26] Consequently, FAA recently recommended changes in user charges to the Congress. In the past, however, Congress generally has not adopted the executive branch's general aviation user charge recommendations, evidently for fear such charges might stifle general aviation and related economic activity.

TABLE 85. Hours flown in general aviation, by aircraft type, 1973 to 1978 and forecast to 2000 (millions of hours)

		Fixed Wing					
		Piston					
Fiscal Year	Total	Single Engine	Multi-Engine	Turbo-Prop	Turbo-jet	Roto-Craft	Ballons, Dirigibles, Gliders
Historical[a]							
1973	28.5	20.8	4.7	1.1	.6	1.1	.2
1974	31.3	22.5	5.2	1.2	.8	1.3	.4
1975	33.3	23.9	5.4	1.3	.8	1.5	.4
1976	35.1	25.4	5.5	1.3	.9	1.7	.3
1977	36.7	26.1	6.0	1.4	1.0	1.8	.4
1978[b] ...	38.6	27.2	6.4	1.6	1.1	1.9	.4
Forecast[c]							
1979	41.4	29.1	6.8	1.8	1.2	2.0	.5
1980	43.6	30.4	7.2	2.0	1.4	2.1	.5
1981	46.2	32.1	7.6	2.2	1.5	2.3	.5
1982	48.6	33.5	8.1	2.4	1.7	2.3	.5
1983	51.0	35.2	8.4	2.5	1.8	2.5	.6
1984	53.6	36.7	8.9	2.7	2.0	2.6	.6
1985	[e]56.0	38.4	9.3	2.8	2.1	2.7	.7
1986	58.5	39.9	9.7	3.0	2.3	2.8	.8
1987	60.8	41.3	10.1	3.2	2.5	2.9	.8
1988	62.9	42.6	10.5	3.4	2.6	3.0	.8
1989	65.3	43.8	10.9	3.7	2.8	3.2	.9
1990	67.4	45.1	11.2	3.9	3.0	3.3	.9
2000[d] ...	[e]91.5	60.0	16.0	5.3	4.3	4.6	1.3

[a] U.S. Federal Aviation Administration, *Statistical Handbook of Aviation*. Prior to 1977, the Federal fiscal year ended on June 30. Detail may not add to total because of rounding.

[b] Estimate.

[c] U.S. Federal Aviation Administration, *FAA Aviation Forecasts Fiscal Years 1979–1990,* Washington, D.C.: September 1978, p. 59.

[d] Year 2000 figures based on a projection of the FAA statistic by NTPSC.

[e] FAA and NTPSC forecasts differ in assumptions and method of calculation. The corresponding NTPSC statistics are: 1985: 63 hrs.; 2000: 123 hrs. (medium-growth scenario).

Automobiles, Vans, and Light Trucks

By far the largest portion of the transportation bill has been and is expected to be for privately owned and operated small trucks and vans. These typically account for over 45 percent of the total.[27]

Table 88 exhibits the components of the bill associated with these vehicles and indicates how the components are expected to change over time. The

TABLE 86. **Ratios of general aviation hours, by aircraft type, forecast to be flown in 1985, 1990 and 2000 to 1975 hours flown**

	Piston						
Years	Total	Single Engine	Multi-Engine	Turbo-prop	Turbo-jet	Rotor-craft	Other
1985/1975	1.68	1.61	1.72	2.15	2.625	1.80	1.75
1990/1975	2.02	1.89	2.07	3.00	3.75	1.89	2.25
2000/1975	2.74	2.51	2.96	4.07	5.375	3.06	3.25

SOURCE: NTPSC (based on data in Table 85).

TABLE 87. **Fuel consumed by general aviation, 1973 to 1978 and forecast to 2000 (millions of gallons)**

Fiscal Year	Total Jet Fuel and Aviation Gasoline	Jet Fuel	Aviation Gasoline
Historical[a]			
1973[b]	715	304	411
1974[b]	800	357	443
1975[b]	865	453	412
1976[b]	927	495	432
1977	992	536	456
1978[c]	1,084	610	474
Forecast[d]			
1979	1,162	654	508
1980	1,270	740	530
1981	1,357	794	563
1982	1,478	878	600
1983	1,553	923	630
1984	1,645	987	658
1985	1,720	1,028	692
1986	1,846	1,094	752
1987	1,959	1,178	781
1988	2,036	1,226	810
1989	2,165	1,328	837
1990	2,274	1,410	864
2000[e]	3,100	1,950	1,150

[a] FAA Estimates. Prior to 1977, the fiscal year ended June 30. Domestic civil aviation is defined for purposes of the table to include all civil aircraft flights which originate and terminate within the 50 states. Estimates of fuel consumed by airframe and aircraft engine manufacturers, whether for flight testing or ground testing, are not shown here because they are not available for domestic industry as a whole and accurate estimates cannot be developed. It should also be noted that general aviation fuel consumption is not reported and historical series are estimates.

[b] Revised.

[c] Estimate.

[d] U.S. Federal Aviation Administration, *FAA Aviation Forecasts Fiscal Years 1979–1990*, Washington, D.C., September 1978, p. 62.

[e] Year 2000 figures based on an NTPSC projection of FAA statistics.

TABLE 88. **Forecast components of the personal automobile vehicle bill, medium-growth scenario, 1975 to 2000 (millions of 1975 $)**

Components	1975	1985	2000
Purchase Price	[b]57,605	[b]71,918	[b]85,609
Tires, Tubes, Accessories	[a]8,889	[f]11,014	[f]13,930
Gasoline and Oil	[a]52,080	[c]65,594	[c]63,837
Tolls	[a]907	[e]832	[e]62
Insurance Less Claims	[a]4,268	[e]9,420	[e]12,300
Interest on Debt	[a]7,451	[e]10,676	[e]11,890
Registration Fees	[a]2,053	[e]2,826	[e]2,460
Operator Permit Fees	[a]264	[e]408	[e]430
Repair, Maintenance, Parking, Storage, Rental	[a]23,696	[f]32,436	[f]43,155
Total	157,213	204,124	233,673
¢/VMT[d]	15.3	15.3	13.4
¢/VMT[g]	15.3	16.8	15.3

[a] Transportation Association of America, *Transportation Facts and Trends*, Washington, D.C.: July 1978, p. 5.

[b] NTPSC estimate based on prices and fleet sales reported in Chapter 10.

[c] 1975 figure increased by percentages indicated by energy cost and efficiency parameters in Chapters 6 and 8.

[d] VMT was computed by using Chapter 9 VMT growth for 1975 to 1985 and 1975 to 2000 and a base-year 1975 VMT historical estimate from Highway Statistics 1976. This estimate assumes the historical rate of government user-charges.

[e] Estimates were computed by using *Transportation Facts and Trends* historical data from 1965 to 1976 converted to 1975 dollars to trend a line to 1985 and 2000.

[f] Calculated using Inforum forecasts of unit price changes for rubber products and NTPSC forecast growth in vehicle-miles traveled.

[g] Potential user charges were added to account for the full costs of financing highway needs at the level of development presented in Table 38.

figures probably understate the costs associated with the auto because they do not include such items as private garages, carports and auto-related personal-use items sold as general merchandise.

As shown in Table 88, almost every auto cost component is anticipated to become more expensive by 2000. In 1975 repair and maintenance was 15 percent of the total personal vehicle bill, while the purchase price of an auto was 36.6 percent. By the year 2000, repair and maintenance costs are estimated to increase to 18.4 percent, while the purchase price is estimated to remain the same, at 36.6 percent. In constant dollars, repair and maintenance cost will nearly double by the year 2000, while gas and oil expense is forecast to rise by 1985 and decline slightly by 2000. The total auto bill is forecast to increase to the year 2000, but at a decreasing rate from 1985 to 2000. Comparisons of forecasts for all modes show auto expenses declining relative to all competitors except commercial aviation.

Table 88 also illustrates that the cost of owning and operating an auto is forecast to decline by 1.9 ¢/VMT by 2000. If potential user charges are added to account for the full cost of highway facilities, auto cost would rise 1.5 ¢/VMT from 1975 to 1985, but would fall thereafter until the year 2000 when it would just equal the 1975 ¢/VMT figure.

A note of caution may be warranted. Disposable personal income per capita (in 1975 dollars) is forecast to double by the year 2000, as illustrated in Chapter 9. With auto costs in 2000 being equal to 1975 costs, the expense of owning and operating an auto would thus decline relative to the average income. The automobile or its equivalent accounts for the single largest share of the nation's transportation bill through the year 2000 in all the NTPSC's scenarios. Auto expenditures are so large that what happens to auto travel affects almost all other modes of transportation. The NTPSC forecasts in Chapter 9 show the equivalent of a 2.5 percent annual growth in vehicle miles of travel for the nation. The U.S. DOT recently forecast the same rate of growth.[28] These forecasts anticipate a decline in the historic growth rates of the last several decades which have generally exceeded 4 percent.[29] Continuation of a 4 percent trend rather than the anticipated 2.5 percent (or establishment of a trend of less than 2.5 percent) would impact many of the statistics reported in Chapters 5 through 11.

Growth in highway travel implies increased auto sales which could affect the economy and modify the forecasts of goods movement patterns. The result might mean increased congestion with consequent time and fuel losses, or more highway construction, particularly in urbanized areas. It should be noted that other modes could accommodate only a small portion of the passengers and freight now served over the highways unless massive sums were invested in railways, waterways, aviation, and transit. (Two year's growth in auto travel exceeds the total current transit ridership in the U.S.)

The government accounts indicate a large and potentially growing subsidy to all forms of highway travel. Though the sum is large, it is modest on a dollar subsidy per market-dollar-expended basis. The government accounts section of this chapter deals more fully with this topic.

Rail Passenger Service

The price to the purchaser of rail passenger services appears to be dictated almost totally by the extent to which government chooses to subsidize the service. More than half the costs of Amtrak are now borne by the general taxpayer. The Secretary of Transportation recently recommended a substantial cut in the network, to reduce expected Amtrak subsidies for the 1980 through 1984 period by roughly one billion dollars.[30] The taxpayer, nevertheless, would still be paying 60 percent of the cost of Amtrak operations in 1985 and 70 percent in 2000, based on projections of the trend indicated by the Secretary's report (medium-growth scenario).

Intercity Buses

Intercity bus travel is expected to grow moderately (see Chapter 9), but to decline as a percent of the intercity passenger market. Package freight haulage by buses is expected to continue growing.

The Bureau of Labor Statistics (BLS) computes price indices for intercity buses. Examination of these indices relative to the GNP indicates bus prices in the past decade have grown faster than prices in the economy in general.[31] Extrapolating this trend indicates a potential increase of 21 percent by 1985 and 60 percent by 2000. The index apparently reflects the large proportion that wages constitute of total unit costs in the bus industry.

The 1978 Surface Transportation Act provides limited, and not yet funded subsidies for intercity bus service.[32] In addition a small share of the more general highway subsidies may be attributed to buses, especially now that intercity buses are exempt from Federal fuel taxes.

Water Passenger Services

Intercity water passenger service consists primarily of ferry boat activity. NTPSC forecasts indicate water travel will grow almost proportionally to the nation's growth in personal automobile vehicle travel. Fuel prices may force water passenger costs up, but economies of utilization, and possibly some decreases in shipbuilding costs, may counter this tendency.

A number of Federal, state and local programs subsidize domestic water passenger transport. For example, some of the Coast Guard's marine safety programs may be attributed to such service, and Alaska subsidizes ferry services along its coasts.

LOCAL TRANSPORTATION

Highway transport is forecast to continue to dominate local transportation in both rural and urban areas. Highway activities accounted for 96 percent of the U.S. local transportation bill in 1975. By 1985, this is expected to decrease slightly to 95 percent (under the medium-growth scenario).

Local Trucking

Chapter 9 forecast vehicle miles of travel for local trucks and projected operating costs. The projections assumed constant cost per vehicle mile of travel, an assumption that may be somewhat low because it does not reflect forecast increases in fuel prices. The government subsidies attributed to local trucking are an allocated share of the subsidies to highways.

Mass Transportation

Urban mass transportation falls largely into the categories of bus and rail transit. Both are almost totally government owned and operated. In the past decade both have been increasingly subsidized, as the fares charged have decreasingly reflected the costs associated with providing the services. Examination of BLS figures from June 1964 to June 1978 shows that transit fares rose at about the same rate as the consumer price index (CPI).[33] Federal, state and local subsidies have risen to cover the increasing gap between revenues and costs. NTPSC's computer simulations assumed continuation of this general policy. They also assumed a constant cost per unit of service in the future.[34]

Public policies aimed at providing more pervasive rather than more intensive service may escalate this cost trend. NTPSC forecasts indicate services in urbanized areas in 1990 will include 14 percent more seat miles of bus service per capita and 62 percent more seat miles of rail transit service per capita, while service per square mile will decline in the largest cities but increase significantly in smaller cities.

As transit service extends farther to gain passengers from competing modes, the costs of reaching a potential passenger increase. Concurrently, competition from autos will increase as autos obtain improved energy efficiency, lower emission rates and improved safety rates.

Transit is heavily subsidized by Federal, state and local governments. Too, a share of more general highway subsidies may be attributable to urban transport by bus. (This latter value is not included in the amount shown in Table 82.)

Taxis

The BLS calculates price indices for taxis. The increase in the price index from June 1964 through June 1978 was 21 percent greater than the change in GNP.[35] Extrapolation of this relationship to 1985 indicates that taxi fares can be expected to increase by 14 percent over 1975 and by 41 percent to 2000. These estimates appear low. The preponderance of taxi costs are the wages of the driver. The NTPSC forecast, by comparison, projects increases in average disposable incomes per capita to the year 2000 of 32 percent (low-growth scenario), 93 percent (medium-growth scenario) and 158 percent (high-growth scenario). If taxi drivers' incomes keep pace with general disposable incomes, either some unforeseen productivity improvement will occur, or taxi fares would be expected to increase at a similar rate.

A small portion of general highway subsidies may be allocated to taxis.

Miscellaneous Items

Miscellaneous items include costs for loading and unloading vehicles, and for freight department and freight forwarder operations. The NTPSC forecasts the constant dollar increases that can be expected at 5 percent by 1985 and 4 percent by 2000.

Private and commercial fishing boats also fall in the miscellaneous category. Because no information on the constant dollar costs per unit of these user-operated segments of transportation was readily available to NTPSC, the unit costs were assumed to be constant.

THE GOVERNMENT ACCOUNT

Ideally, any set of government transportation accounts would show, for each level of government, the receipts by source (e.g., general tax revenues, user charges, borrowing) for each mode, the expenditures going to each purpose (e.g., capital, land, operations, administration, debt service) for each recipient, and the transfers of funds between governments. The accounts described here cover only the first two items: receipts and expenditures. Appendix IV contains a table which lists all the items, both expenditures and receipts, considered in the accounts as of 1975. Recent statistics have added new items that will appear in the accounts for later years. Line items for 1975, such as the operation of the St. Lawrence Seaway and the Panama Canal, for which user-charge revenues approximate current expenditures, were excluded from the accounts for future years. Table 89 summarizes total government subsidies, Federal, state and local.

The government accounts serve several purposes. First, they provide the estimates of government subsidy shown in Table 80. Second, they give estimates of the total magnitude of government funds involved in each market and modal sector. Third, they show that the Federal government is but one of several levels of government heavily supporting transportation.

A few general comments are in order regarding basic data on which the accounts were based. Some line items have labels such as ICC, CAB, FMC, NASA, National Mediation Board, NTSB, and Department of Commerce, National Oceanic and Atmospheric Administration. In each case, the part of an agency's budget attributable to transportation has been allocated to the related transportation modes.

There are different ways to attribute and allocate such items. Each way will yield a somewhat different answer for a given mode. In general, the allocations shown in the succeeding sections are based on 1975 data.[36]

Forecasts of the government accounts are more difficult and speculative. Wherever practical they reflect NTPSC forecasts of activity combined with extrapolations of present practices into the future. Forecasts were made of individual line items. The subsidies were then calculated by subtracting government user charge receipts from government expenditures.

In general, those items with small financial impact on overall modal accounts (such as regulation, weather services, and research and development) were assumed to continue at their 1975 constant dollar values. The amounts of subsidy to any mode from these items were small relative to other programs. The larger and more direct government financing items were each analyzed and forecast separately on an item-by-item basis. In the several instances where government user charge receipts exceeded government expenditures, the surplus was not subtracted from the overall subsidy totals. These instances are noted in the tables.

The basis for computing specific subsidy values for alternative scenarios was insufficient for some line items and such calculations were not made. Thus the "Government Accounts" in Table 89 display medium-growth scenario values. Values for the other scenarios where different, are presented in separate tables.

TABLE 89. Government subsidy accounts by market, medium-growth scenario, 1975, 1985 and 2000 (millions of 1975 $)

	1975		1985		2000	
	Federal	Other	Federal	Other	Federal	Other
International Water Freight						
Opr. Diff. Sub.	243		361		398	
Const. Diff. Sub.	241		268		460	
DOD USA CoE	143		154		219	
FMC	3		3		3	
DOS	2		2		2	
DOT Off. Sec.	6		6		6	
USCG	119		119		119	
Ports & Terminals		4		4		4
Subtotal	757	4	913	4	1107	4
Grand Total	761		917		1111	
International Air Freight						
CAB	1		1		1	
NTSB	1		1		1	
DOC NOAA	2		2		2	
DOS Neg	3		3		3	
DOT: OS	2		2		2	
FAA	23		10		5	
NASA	36		36		36	
State Program		[a]		[a]		[a]
Grand Total	68		55		50	
International Air Passenger						
CAB	2		0		0	
NTSB	1		1		1	
DOC NOAA	2		2		2	
DOS	4		4		4	
DOT: OS	2		4		4	
FAA	[c]		14		8	
NASA	51		51		51	
	[c]		[c]		[c]	
Subtotal	62		76		70	
Grand Total	62		76		70	
International Water Passenger						
State and Local	nil		nil		nil	
Ports & Terminals		1		1		1
Subtotal	nil	1	nil	1	nil	1
Grand Total	1		1		1	
Intercity (and Rural) Truck Freight						
ICC	22		22		22	
NTSB	1		1		1	
DOT OST	5		5		5	
Highways	[d]	1639	1593	5967	3317	10344
Subtotal	28	1639	1621	5967	3345	10344
Grand Total	1667		7588		13689	
Intercity Water Freight IWW						
TVA Channel	12		12		12	
USA COE	536		532		776	
USCG	153		153		153	
Alaska Ferry		8		15		36
Ports & Terminals	59	59	59			
Subtotal	701	67	697	74	984	95
Grand Total	768		821		1079	

U.S. INTERNATIONAL GOVERNMENT ACCOUNTS

Marine-related items dominate the U.S. international government subsidy accounts of Table 89. The Federal ship Operating and Construction Differential Subsidies administered by MarAd, and the attributable portion of the ports and harbors work of the Corps of Engineers, are the largest subsidy items. Each is expected to rise through the year 2000.

NTPSC forecasts of Operating Differential Subsidies were based on U.S.-flag fleet forecasts described in Chapter 9. They therefore differ across scenarios. Table 90 gives the numbers for each scenario and time period. It should be noted that the world shipping situation is one determinant of this subsidy and it may be subject to broad fluctuations.

NTPSC forecasts suggest some decreases in the constant dollar costs of U.S. shipbuilding, but the construction differential subsidy depends on both U.S. and world shipbuilding costs. The construction differential subsidy forecasts will thus be affected by world construction price trends for which no estimate

TABLE 89. **Government subsidy accounts by market, medium-growth scenario, 1975, 1985 and 2000 (millions of 1975 $)—Continued**

	1975		1985		2000	
	Federal	Other	Federal	Other	Federal	Other
Intercity Rail Freight						
ICC	22		22		22	
Nat. Mediation Board	2		2		2	
NTSB	1		1		1	
DOT: OS	22		22		22	
R&D	64		64		64	
Rail Sys. Asst.	169		–72	31	–72	31
Disaster Relief	2	2	2			
Subtotal	282	2	185	31	185	31
Grand Total	284		216		216	
Intercity Pipelines						
DOE	12		12		12	
DOT	14		14		14	
Grand Total	26		26		26	
Intercity Air Freight						
CAB: Reg	3		0		0	
CAB: Subsidy	5					
NTSB	1		1		1	
DOC NOAA	3		3		3	
DOT: US	2		5		5	
FAA	144		80		44	
NASA	47		47		47	
State & Local Programs		14		25		44
Subtotal	205	14	136	25	100	44
Grand Total	219		161		144	
Intercity & Rural Autos, Small Trucks Passenger						
ICC	1		1		1	
U.S. DOT OS	8		8		8	
Highways	1187	3165	3585	9472	5982	15778
Subtotal	1169	3165	3594	9472	5991	15778
Grand Total	4361		13066		21769	
Intercity Rail Passenger						
Amtrak	308		677	4	975	4
Total	308		681		979	
Intercity & Rural Bus Passenger						
Services	0	0	30	12	30	12
Facilities	0	0	40	4	40	4
NY; NJ Bus Commuter Programs				55		55
Subtotal	0	0	70	71	70	71
Grand Total	0		141		141	

TABLE 89. **Government subsidy accounts by market, medium-growth scenario, 1975, 1985 and 2000 (millions of 1975 $)—Continued**

	1975		1985		2000	
	Federal	Other	Federal	Other	Federal	Other
Intercity Aviation Passenger						
CAB: Reg	12					
CAB: Sub.	58					
NTSB	4					
App. Reg. Com	3	1				
DOC NOAA	11		11		11	
DOT: OS	7	77	77			
FAA	582		538		295	
NASA	170		178		178	
State & Local Programs		268		424		929
Subtotal	847	268	815	424	561	929
Grand Total	1115		1239		1490	
Intercity Water Passenger						
USCG	1		1		1	
Alaskan Ferry		8		15		36
Ports & Terminals		1		1		1
Subtotal	1	9	1	16	1	37
Grand Total	10		17		38	
Local (Urban) Highways Passenger	924	2473	2805	7450	4688	12422
Grand Total	3397		10225		17110	
Local Passenger Urban Mass Trans.	928	1109	2158	1532	3596	2671
Grand Total	2038		3690		6267	
Local (Urban) Freight Highways	[e]	209	250	720	540	1300
Subtotal	[e]	209	250	720	540	1300
Grand Total	209		970		1840	
Local Passenger School Bus		1888		2667		4542
Miscellaneous Boats						
USCG	251		251		251	
USA COE	8		8		8	
DOC NOAA	4	4	4			
Subtotal	263		263		263	
Grand Total	263		263		263	

SOURCE: NTPSC forecasts.

[a] State and local receipts from fees and charges are expected to cover program costs.

[b] International user charge receipts covered FAA expenditures

[c] State and local user charge receipts are expected to cover their expenditures.

[d] According to the methods of allocation used by the MITRE Corporation, user-charge receipts covered attributed costs. For a discussion of the topic, see the section on the Highway Trust Fund in the text.

[e] *Ibid.*

TABLE 90. Variations in operating differential subsidy, all scenarios, 1975 to 2000 (millions of 1975 $)

Base Year 1975	Low-Growth Scenario		Medium-Growth Scenario		High-Growth Scenario	
	1985	2000	1985	2000	1985	2000
243	312	304	361	398	406	649

SOURCE: NTPSC forecasts.

was prepared. Corps of Engineers port and harbor expenditures are more predictable because these costs increasingly involve the maintenance of existing channels.

Total U.S. international marine subsidies constituted about 11 percent of the U.S. international marine bill in 1975. Under medium-growth scenario conditions the projections are 9 percent for 1985 and 8.6 percent for 2000.

The subsidies to U.S. international aviation made up about 1.5 percent of the U.S. international aviation bill in 1975. Under medium-growth scenario conditions the corresponding figure for 1985 and for 2000 is 1.4 percent.

DOMESTIC TRANSPORTATION GOVERNMENT ACCOUNTS

The largest subsidies to domestic transportation are for highways, aviation, inland waterways, urban mass transportation and railroads (in order of decreasing total amount). This list excludes pipelines. The only Federal expense items attributable to pipelines are the relatively low costs associated with government regulation. The major individual line subsidies for domestic transportation in Table 89 are all allocations of broader major subsidy programs. Each modal program has unique characteristics. The following sections describe the nature of each broad major program.

Highways

Chapter 10 discussed the NTPSC's forecasts of highway revenues and the need for highway investment. It indicated that highway "needs" encompassed more than capital investment. Federal, state and local governments spend more on highways than they receive in user charge revenues. NTPSC forecasts show a continuation of this pattern if highway financing practices do not change. (See Table 91.)

The Federal Highway Administration has maintained a set of continuous financial accounts on the nation's highways for many years. Table 92 shows its summary account for 1975.

TABLE 91. Forecast highway finances, all scenarios, 1985 and 2000 (billions of 1975 $)

	1985	2000
Low-Growth Scenario		
Government Disbursements	−49.2	−67.0
User Charge Revenues	+29.1	+30.3
Net	−20.1	−36.7
Medium-Growth Scenario		
Government Disbursements	−50.3	−71.0
User Charge Revenues	+29.7	+31.7
Net	−20.6	−39.3
High-Growth Scenario		
Government Disbursements	−50.8	−74.1
User Charge Revenues	+29.9	+32.8
Net	−20.9	−41.3

SOURCE: NTPSC forecasts.

It should be noted from Table 92 that Federal disbursements account for about 25 percent of national highway expenditures, while states account for about 54 percent and local governments about 21 percent. In 1975, each level of government contributed funds from general fund appropriations. For purposes of the government accounts these were considered subsidies. At the Federal level, the contributions from general funds come largely from agencies other than DOT. For example, general revenue sharing funds distributed by the Treasury and used by the recipient governments for highway purposes would fall in this category. Another example is the funds appropriated for regional development that the Appalachian Regional Commission expended on highways.

Local governments spend funds on highways that in part were raised from property taxes. These are accounted for in the government accounts tables as subsidies. A few such taxes could be considered a form of user charge—particularly in the case of a local assessment on property abutting a road where the assessment is related to the costs associated with roads serving the property (for example, snow removal, annual maintenance, or curbs and gutters).

The remainder of the funds expended on highways are largely derived from user fees or borrowing.

HIGHWAY REVENUE SOURCES

The subsidy shown for highways in Tables 82 and 93 assume the same disbursement of funds across highway uses as existed in 1975. Note that in 1975 the Federal government disbursed about $2 billion more for highways than it received in user charges. The figure for state and local governments was

TABLE 92. 1975 highway receipts and disbursements by agency, 1975[a] (millions of $)

	Agencies				
	Federal Government	State Agencies and D.C.	Local Rural Government	Municipalities	Total
Receipts					
Imposts on Highway Users:[b]					
Motor-Fuel and Vehicle Taxes	5,699	11,335	84	123	17,241
Tolls	—	1,052	32	179	1,263
Parking Fees	—	—	1	119	120
Subtotal	5,699	12,387	117	421	18,624
Other Taxes and Fees:					
Property Taxes and Assessments	—	—	958	704	1,662
General Fund Appropriations	1,298	504	472	1,803	4,077
Miscellaneous Taxes and Fees	21	220	39	128	408
Subtotal	1,319	724	1,469	2,635	6,147
Investment Income & Other Receipts	723	538	169	254	1,684
Total Current Income	7,741	13,649	1,755	3,310	26,455
Bond Issue Proceeds (Par Value)[c]	—	1,412	235	546	2,193
Grand Total Receipts[d]	7,741	15,061	1,990	3,856	28,648
Intergovernmental Payments:					
Federal Government	–6,655	5,887	457	311	—
State Agencies	—	–3,033	1,878	1,155	—
Local Rural Governments	—	101	–192	91	—
Municipalities	—	102	2	–104	—
Subtotal	–6,655	3,057	2,145	1,453	—
Funds Drawn From or Placed in Reserves[e]	–453	72	–114	—	–495
Total Funds Available	633	18,190	4,021	5,309	28,153
Disbursements					
Capital Outlay (Right-of-Way and Construction):					
On Rural State-Administered Highways	—	7,022	17	—	7,039
On Municipal Extensions of State Highways	—	3,147	—	20	3,167
On Local Rural Roads	—	457	1,278	—	1,735
On Local Municipal Roads and Streets	—	—	54	1,549	1,988
On Territorial Roads[f]	18	—	—	—	18
Not Classified by System	314	—	—	—	314
Subtotal	332	11,011	1,349	1,569	14,261
Maintenance (Includes Traffic Services):					
On Rural State-Administered Highways	—	2,369	7	—	2,376
On Municipal Extensions of State Highways	—	577	—	45	626
On Local Rural Roads	—	25	1,993	—	2,018
On Local Municipal Roads and Streets	—	16	50	1,895	1,961
Not Classified by System	89	—	—	—	89
Subtotal	89	11,011	2,050	1,944	7,070
Administration and Research[g]	212	1,124	278	373	1,987
Highway Police and Safety	—	1,337	87	798	2,222
Interest on Debt	—	823	89	208	1,120
Total Current Expenditures	633	17,282	3,853	4,892	26,660
Debt Retirement (Par Value)[h]	—	908	168	417	1,493
Grand Total Disbursements	633	18,190	4,021	5,309	28,153

SOURCE: U.S. Federal Highway Administration, *Highway Statistics, Summary to 1975.* Washington, D.C.: Government Printing Office, pp. 120, 135.

[a] Federal and state data are for calendar years; local rural and municipal governments data are for fiscal years ending in various months of the calendar year.

[b] Excludes amounts allocated for collection expenses and non-highway purposes.

[c] Proceeds of short-term notes and refunding issues are excluded. Premium and discounts on sale of bonds are included with "Investment Income and Other Receipts."

[d] Includes forest highway and other funds administered by the FHWA, as well as funds of other Federal agencies not derived from the Highway Trust Fund.

[e] Minus signs indicate that funds were placed in reserve.

[f] Includes data for Puerto Rico.

[g] Includes small amounts of miscellaneous expenditures and engineering and equipment costs not charged to capital outlay and maintenance

[h] Redemption premiums and discounts are included with interest payments. Redemption of short-term notes, or by refunding, is excluded

TABLE 93. Highway cost responsibility based on 1975 disbursement and revenue practices, medium-growth scenario, 1975 and 2000 (millions of 1975 $)

	1975	1985	2000
Federal Disbursement	−7,741	−13,814	−19,519
Federal User Charge Revenues	+5,699	+5,636	+5,116
Net (Subsidy)	−2,042	−8,178	14,403
State and Local Disbursement	−20,412	−36,436	−51,461
State and Local User Revenue	+12,925	+12,764	+11,584
Net (Subsidy)	−7,487	−23,672	−39,877
Total Disbursements	−28,153	50,250	70,980
Total User Charge Revenues[a]	+18,624	+18,400	+16,700
Net (Subsidy)	−9,529	−31,850	−54,280

SOURCE: NTPSC calculations.

[a] From Table 42.

almost $7.5 billion. Continuation of the present practice would increase the Federal figure more than sevenfold and the state and local figure more than fivefold by the year 2000. Federal subsidies would grow from 26 percent of Federal disbursements to 74 percent while state and local subsidies would rise from 37 percent of disbursements to 72 percent.

Another approach is to assess what the various Federal and state tax rates would have to be in order to maintain the same percentage relationships between disbursements and user charge revenues that existed in 1975. These percentages of subsidy to total bill are 26 percent for Federal funds, 37 percent for state and local funds, and 34 percent overall for total disbursements. Appendix Table 58 shows this alternative. The general taxpayer would pay less in future years in this alternative compared to a continuation of 1975 disbursement and revenue practices.

Appendix Table 59 compares the resulting Federal tax schedules for the two alternatives. Present practice would retain the 1975 rates. The alternative distributes the user charge burden for future years to each form of user charge tax in proportion to its share in 1975. The burden in each tax category is then divided by the forecast activity for the year to yield the new tax rates. Some rates decline. Fuel taxes show the greatest percentage increases due to lower fuel consumption per VMT. Appendix Table 60 puts the topic in a more current perspective. It shows what the constant 1975 dollar prices would amount to in current dollars, assuming a 5 percent inflation rate per year. One result is a fuel tax price of just over $3 per gallon in the year 2000 under medium-growth scenario conditions.

FEDERAL HIGHWAY FUND ALLOCATIONS

Federal highway disbursements go mostly to state and local governments for their use. In turn, a portion of state disbursements go to local governments for expenditure on their projects.

The Federal funds come chiefly from a Highway Trust Fund supported by user charge revenues. Highway Trust Fund disbursements are earmarked for variously defined categories of capital investment. The allocation of funds in a given category among recipients is based almost totally on statutory formulas.

Formulas for the Federal-aid categories of rural primary and secondary roads were established in the early 1900s, and despite minor changes have never been modified substantially. The formulas for the Interstate Highway and Urban Systems were established when these programs began in the 1950s and 60s. On a national level it does not appear that the formulas were based on what Federal allocation might provide the greatest net benefits from the expenditure. This does not mean that the distribution formulas were developed without benefit of analysis. Goals other than economic efficiency—such as equity, national connectivity, and full employment—may have guided the establishment of some of the formulas. Too, some states use sophisticated economic techniques in establishing priorities for the expenditure of funds under their control, including the funds disbursed to them by the Federal government.

States and localities are required to match the Federal funds they receive with their own funds. The percentage matching ratio depends on the category of program and, in some cases, on the amount of Federal land in the state. Several characteristics of this method of allocation are worth noting. A state or locality may receive more than it wishes to spend in a specific category. Congress in the past decade has increasingly recognized this by allowing recipients to switch percentages of some categories of funds to specific other categories. This tends to weaken any relationship that was intended among the categories for which the Congress appropriated money and the desired ends to be achieved, and the relationship is further weakened to the extent states withdraw their funds from a category and spend them elsewhere (not necessarily on highways). Studies indicate that except for tightly controlled categories of programs in which the Federal government foots the preponderance of the bill, and forbids expenditures elsewhere, Federal highway disbursements have much the same effect as general revenue sharing, i.e., they tend to act like an infusion of general purpose funds.[37] However, unlike general revenue sharing, highway disbursements are based on historically fixed formulas which may not be related to present objectives. One alternative to the present practice that has been advanced is transportation revenue-sharing, in which Federal highway funds would be allocated in accord with a formula to each state, for use without categorical constraints. This might simplify administration and provide states more flexibility to do what they feel best serves their interest, but would reduce the Federal government's capacity to focus funds on specific categories of national interest. Another alternative would be to have even more categories with a formula for allocation to each category. Each recipient could be allowed broad flexibility to transfer funds from one category to another (perhaps depending on notification of DOT or DOT's approval).

No matter what scheme is adopted, so long as the Federal government collects and disburses highway funds, a rational basis for allocating the funds among states appears needed. Present methods result in some states being major donors and others major recipients. The effects of the formulas do not appear to be based on explicit income redistribution goals.

HIGHWAY NEEDS

Needs estimates have been prepared on a continuing basis to determine national highway funding requirements.

Table 94 compares alternative sets of needs state-by-state. One set is based on reports by states in the 1974 National Transportation Report. The second consists of Economic Analysis Needs developed by the NTPSC, based on an analysis of arterial and collector needs reported in the 1972 National Highway Needs Report. The second approach spends less and would minimize Federal subsidy. Unfortunately, the FHWA "Basic" alternative published in the 1976 National Highway Inventory and Performance study,[38] and used by NTPSC to estimate the nationwide capital needs reported in Chapter 10, is not available in state-level detail for comparison with the two alternatives shown in Table 94.

Table 95 compares four alternative allocations among the states, shown to illustrate the degree of difference that may result from different methods. The first column reflects fiscal year 1979 Federal-Aid Apportionments, based on all the separate formulas previously mentioned. The second column is based on the percentage of travel expected in each state over the 1975 to 1990 period. It not only indicates where the travel will take place, but may be viewed as a crude indicator of the amount of Federal user charge revenue originating in each state. Funds allocated on this basis would tend to eliminate the donor-recipient situation. (The Federal government could make receipt of the fund contingent upon support of any national objective the Congress deemed appropriate.) The third column reflects needs reported to DOT by each state for the 1974 *National Transportation Report* and *National Transportation: Trends and Choices* in 1977. The fourth column reflects Economic Analysis needs as computed in 1972, apparently the last time a state-by-state

TABLE 94. Highway needs alternatives,[a] 1975 to 1990 (millions of 1975 $)

	State Reported "Needs" 1975–1990[b]	Economic Analysis "Needs" 1975–1990[c]
Alabama	7,911	7,298
Alaska	6,328	1,256
Arizona	12,722	7,346
Arkansas	6,128	5,805
California	38,743	42,633
Colorado	6,964	4,629
Connecticut	7,363	8,064
Delaware	2,236	941
District of Columbia	3,820	2,590
Florida	37,916	27,599
Georgia	15,796	10,112
Hawaii	4,289	2,430
Idaho	2,161	1,109
Illinois	50,572	24,206
Indiana	12,637	7,337
Iowa	17,692	10,047
Kansas	8,801	4,782
Kentucky	8,839	7,633
Louisiana	16,247	11,118
Maine	3,049	1,898
Maryland	14,977	12,217
Massachusetts	16,611	16,984
Michigan	20,737	21,226
Minnesota	12,224	7,027
Mississippi	8,717	4,560
Missouri	28,385	15,974
Montana	4,061	2,479
Nebraska	6,833	3,892
Nevada	2,211	1,835
New Hampshire	2,613	2,157
New Jersey	37,536	26,296
New Mexico	3,688	2,137
New York	81,783	57,381
North Carolina	28,327	16,475
North Dakota	2,835	1,071
Ohio	24,631	24,783
Oklahoma	7,753	6,775
Oregon	6,299	6,152
Pennsylvania	30,477	22,914
Rhode Island	3,293	4,102
South Carolina	8,617	4,307
South Dakota	3,100	1,656
Tennessee	15,123	10,421
Texas	59,343	33,784
Utah	2,800	2,266
Vermont	1,559	1,190
Virginia	16,847	14,410
Washington	12,152	7,639
West Virginia	6,319	3,477
Wisconsin	24,083	17,172
Wyoming	2,354	1,301
National Total[d]	766,500	542,893

[a] Needs figures include requirements for expenditures on capital, operations, maintenance, administration and interest on debt.

[b] *U.S. Department of Transportation, National Transportation: Trends and Choices (to the Year 2000),* Washington, D.C.: Government Printing Office, 1977, p. 315. The NTPSC adjusted the statistics to account for 1972 through 1975 expenditures in each state and estimated operations and maintenance costs over the 1975 to 1990 period based on 1975 data from Highway Statistics and 1980 and 1990 data reported in *National Transportation: Trends and Choices.*

[c] U.S. Secretary of Transportation, *1972 National Highway Needs Report,* 92nd Cong., 2d Sess., Washington, D.C.: Government Printing Office, 1972. The NTPSC used unpublished computer outputs that led to the nationwide results reported as one alternative in this source.

[d] Excluding Puerto Rico, Samoa, Guam, and the Virgin Islands.

TABLE 95. Comparison of alternative allocation of Federal highway funds

	% of FY 1979 Federal-Aid Highways Apportioned to Each State[a]	% of 1976 to 1990 Vehicle Miles of Travel in Each State[b]	% of 1976 to 1990 State-Reported Needs in Each State[c]	% of 1976 to 1990 Economic Analysis Needs in Each State[d]
Alabama	02.06	01.96	01.01	01.34
Alaska	01.53	00.24	00.83	00.23
Arizona	01.57	01.24	01.66	01.35
Arkansas	00.93	01.16	00.80	01.06
California	06.72	09.99	05.06	07.85
Colorado	01.36	01.25	00.91	00.85
Connecticut	01.85	01.33	00.96	01.48
Delaware	00.47	00.28	00.29	00.17
District of Columbia	01.13	00.21	00.50	00.47
Florida	02.94	02.99	04.94	05.08
Georgia	02.40	03.39	02.06	01.86
Hawaii	00.86	00.30	00.56	00.44
Idaho	00.66	00.44	00.28	00.20
Illinois	04.66	04.33	06.60	04.45
Indiana	01.45	00.26	01.65	01.35
Iowa	01.54	01.46	02.31	01.85
Kansas	01.50	01.06	01.15	00.88
Kentucky	02.12	01.78	01.15	01.40
Louisiana	02.73	01.56	02.12	02.04
Maine	00.57	00.51	00.40	00.34
Maryland	02.83	01.92	01.45	02.25
Massachusetts	02.58	02.17	02.17	03.12
Michigan	02.84	04.97	02.71	03.90
Minnesota	02.29	01.93	01.60	01.29
Mississippi	01.03	01.05	01.13	00.83
Missouri	02.23	02.18	03.70	02.94
Montana	00.93	00.42	00.53	00.45
Nebraska	00.87	00.82	00.89	00.71
Nevada	00.79	00.31	00.39	00.33
New Hampshire	00.55	00.41	00.34	00.39
New Jersey	02.24	03.52	04.90	04.84
New Mexico	00.95	00.78	00.48	00.39
New York	05.94	05.80	10.67	10.56
North Carolina	02.18	02.53	03.70	03.03
North Dakota	00.66	00.38	00.37	00.19
Ohio	03.45	04.57	03.21	04.56
Oklahoma	01.04	01.74	01.01	01.24
Oregon	01.42	01.24	00.82	01.13
Pennsylvania	04.98	04.89	03.98	04.22
Rhode Island	00.93	00.41	00.43	00.75
South Carolina	01.25	01.50	01.12	00.79
South Dakota	00.60	00.38	00.40	00.30
Tennessee	02.05	02.56	01.97	01.91
Texas	05.74	06.70	07.74	06.22
Utah	00.91	00.69	00.37	00.41
Vermont	00.55	00.25	00.20	00.21
Virginia	03.25	02.87	02.20	02.65
Washington	02.58	01.88	01.59	01.40
West Virginia	01.59	00.72	00.82	00.64
Wisconsin	01.56	01.99	03.14	03.16
Wyoming	00.44	00.28	00.31	00.23

[a] Federal Highway Administration Apportionment Tables.

[b] U.S. Secretary of Transportation, *The Status of the Nation's Highways: Conditions and Performance, Report of the Secretary of Transportation to The United States Congress,* 95th Cong., 1st Sess., Washington, D.C.: Government Printing Office, September 1977, pp. 61–65, 402–404. The NTPSC used 1975 and 1990 traffic estimates by state to estimate the entire time period for each state.

[c] U.S. Department of Transportation, *National Transportation: Trends and Choices, (to the year 2000),* Washington, D.C.: Government Printing Office, 1977, p. 315. Figures were adjusted by the NTPSC to reflect 1972–1975 expenditures in each state. These expenditures by state came from source "b" above.

[d] U.S. Secretary of Transportation, *1972 National Highway Needs Report,* 92nd Cong., 2d Session, Washington, D.C.: Government Printing Office, 1972, p. VI–34. The NTPSC used unpublished computer reports as one alternative source.

economic analysis of the preponderence of the nation's highway needs was performed. Though dated, it indicates the form of distribution which gives the greatest economic benefit per Federal dollar expended.

Chapter 10 (see Table 38) discussed highway capital needs estimates under the NTPSC's three scenarios, pointing out that highway needs are broader than capital investment. Government funds pay debt service, administration, maintenance and operation, and other expenses amounting to about half of the government-controlled highway expenditures in 1975. It may be recalled that the NTPSC highway cost estimates are based on the cost of retaining today's levels of highway condition and performance. There appear to be reasonable economic arguments for improving service levels on some classes of roads, such as arterials in urbanized areas, rather than maintaining the status quo.

COST ALLOCATION

A perennial debate concerning the Federal Highway Trust Fund and a number of state highway programs is whether a particular user group or geographic entity (rural vs. urban) pays its proper share. The issue seems to center on the method used to allocate joint and common costs of highways.

A recent and thorough study by the Urban Institute addressed these issues as related to the Federal Highway Trust Fund, finding that:[39]

1. Rural road expenditures exceeded rural user-charge revenues;
2. Urban road revenues from users exceeded urban road expenditures;
3. Total expenditures on all classes exceeded user charge payments; and
4. User charge revenues derived from medium and heavy trucks did not fully cover all the public costs potentially attributable to them. Receipts from truckers equal or exceed the public costs for which they are *directly* accountable (see Appendix Table 61). But the degree to which payments exceed direct costs is so slight that almost any reasonable allocation to them of a share of the costs common to all users (i.e., columns marked "Common Expenditures" in Appendix Table 61) would result in underpayment.

Aviation

The Airport and Airways Trust Fund covers a portion of the U.S. DOT's expenditures for aviation. States, local governments and public airport sponsors are the recipients of Federal aid for aviation. More than two thirds of Federal aid to airports is disbursed on a formula basis, with the remainder disbursed at the discretion of the Secretary of Transportation. Dollars from the Trust Fund are restricted largely to use for capital investment. In 1975 this category comprised 70 percent of total Federal aviation expenditures. According to the forecasts, although a significant increase in total funds is expected, operations and maintenance may decline to 65 percent of total expenditures by 1985, due to an increase in Airport Development Aid Program funding. By the year 2000, operation and maintenance may account for 69 percent as the number of airports remains constant while funding for operations needs increase.

It should be mentioned that the NTPSC forecasts of operations and maintenance costs, which consist mainly of labor costs at enroute and terminal air traffic control centers, assume a very slight increase in labor productivity. Current FAA policy is to significantly increase labor productivity through capital expenditure in facilities and equipment.[40] Increased productivity would lower operations and maintenance expenditures and increase facility and equipment outlays coming from the Trust Fund.

A significant increase in Airport Development Aid Program funding will be required according to NTPSC capital projections. These funding levels are somewhat higher than those which would result from the NASP estimates. Once higher levels are attained, however, annual airport expenditures should not increase (in constant dollar terms) and are even expected to decline.

Table 96 compares for each scenario the Trust Fund revenues, Trust Fund expenditures, and FAA expenses not covered by the Trust Fund. The credit for public use includes costs attributable to military and other government aviation. The degree of Federal subsidy (or surplus) varies greatly between scenarios. However, Trust Fund expenditures were assumed constant for all scenarios. Further, in some scenarios and for some years, the amount expended exceeds Trust Fund revenues. The information as presented shows the potential for a deficit. However, the table assumes that in a deficit situation, expenditures for Trust-Fund-eligible items would be constrained by Trust Fund revenues.

The "FAA Operation and Maintenance Expenditures" shown in Table 97 may be severely understated. These expenditures are largely associated with FAA employment (because most capital is covered by the Trust Fund). The numbers shown reflect employment increases due to increased traffic handled, but assume salaries remain at the 1975 constant dollar level. NTPSC's national economic assumptions indicate the increases in constant dollar disposable income per capita shown in Table 97. (If the average wages of FAA employees were to increase by the same percentage, FAA non-Trust Fund expenditures would increase accordingly, and the last line of Table 96 would be as shown in Appendix Table 62.) Increases in the productivity of FAA employees might offset increased salaries, but the degree of offset was not forecast.

The subsidy to various categories of civil aviation as a result of FAA services has been a sporadic issue over the past two decades. Controversy has centered around these questions:

1. To what degree, if any, should general tax revenues be used to pay FAA costs attributable to civil aviation?
2. What method of attributing costs is most reasonable?
3. By what amounts do the various user groups fail to pay their share of attributed costs?

Since the mid-1950s, the FAA has periodically calculated the shares of its costs attributed to various user categories. In 1978, the FAA undertook the most recent aviation cost allocation study, concluding that 14 to 16 percent of FAA costs might be considered a "public good" appropriate for payment from general tax revenues. (This includes credit for the handling of military and civil government aircraft.) In the past, Congress has apparently considered the public good percentage to be greater than that estimated by the DOT. Of the remaining FAA costs,

TABLE 96. Variation in airport and airway trust fund revenues and FAA operating and maintenance costs for all scenarios, 1975 to 2000 (millions of 1975 $)

		Low-Growth Scenario		Medium-Growth Scenario		High-Growth Scenario	
	1975	1985	2000	1985	2000	1985	2000
Trust Fund Revenues	[a]1,058	857	1,595	1,484	2,815	1,689	4,100
Expenditures	[a]–587	–1,558	–1,595	–1,558	–1,595	–1,558	–1,595
Net	471	–701	0	–74	1,220	131	2,505
FAA Operations and Maintenance[c]	[a]–1,395	–1,858	–3,011	–2,013	–3,513	–2,109	–3,747
Credit for Public Use[d]	308	1,298	1,261	1,357	1,941	1,393	2,030
Net		–560	[e]–1,750	[e]–656	–352	–585	+788

SOURCE: NTPSC forecasts.

[a] See Appendix IV regarding aviation expenditures.

[b] With minor exceptions trust fund revenues cannot be spent for FAA operations and maintenance. A surplus cash flow to the fund may be spent on fund-eligible items in future years. However the net annual cash flow method was used for all modes in the government account calculations and subsidy for a given year was decreased by government expenditures minus government revenues.

[c] NTPSC calculations based on the method reported in U.S. Federal Aviation Administration, *An Econometric Analysis of Enroute and Terminal Air Traffic Control,* Washington, D.C.: June 1976.

[d] For 1975 see Appendix Table 56 and Appendix IV regarding aviation expenditures. For other years a constant 38 percent of the Trust Fund plus FAA operations and maintenance expenses was used. This is based on FAA forecasts reported in U.S. Federal Aviation Administration, *Financing the Airport and Airway System: Cost Allocation and Recovery,* Draft, Washington, D.C.: November 1978, pp. 19–46.

[e] Assumes expenditures for trust fund eligible items would be limited to funds entering the trust fund in the year. It is possible that previous surpluses in the fund could be carried forward to cover the total expenditure.

air carriers pay 88 percent and general aviation pays 14 to 25 percent of the FAA costs attributable to them. It is forecast by the FAA that by 1987 the corresponding figures would be 103 percent for air carriers and 11 to 21 percent for general aviation if present user charge practices continue and FAA productivity increases.[41]

Intercity Rail Passenger Service

In January 1979, the U.S. Secretary of Transportation submitted his *Final Report to Congress on the Amtrak Route System,* which recommended a cutback in Amtrak routes to take effect if Congress did not object in the period of time established by law. The Federal subsidy forecasts shown in the NTPSC government accounts are a linear extrapolation of the five year (1980 through 1984) trend forecast in that report, as shown in Table 98. (Rail freight financing is discussed in Chapter 10.)

TABLE 97. Forecast per capita growth in disposable income, by scenario, comparisons of 1985 and 2000 with 1975

Yearly Percentage Growth by Time Period and Scenario					
Low-Growth Scenario		Medium-Growth Scenario		High-Growth Scenario	
1985	2000	1985	2000	1985	2000
1.22	1.32	1.35	1.94	1.47	2.58

SOURCE: NTPSC forecasts.

TABLE 98. Intercity rail passenger service subsidies, medium-growth scenario, 1980 to 2000 (millions 1975 $)

	Total	Capital	Operating
1980	563	154	409
1981	612	194	418
1982	608	206	402
1983	619	242	377
1984	650	254	396
1985	677		
2000	975		

SOURCE: 1980 through 1984 statistics, U.S. Department of Transportation, *Final Report to Congress on the Amtrak Route System,* Washington, D.C.: January, 1979, p. 5–3. Statistics modified by the NTPSC to reflect constant 1975 dollars; six percent per annum inflation assumed from 1975 through 1979 and five percent assumed thereafter.

Intercity Marine

The government accounts for domestic intercity water transportation show receipts to the newly established Inland Waterway Trust Fund for future years. This fund was described in Chapter 10 and Table 59 shows the expected revenues under each of three scenarios. Trust Fund receipts are expected to fall far short of covering the Federal expenditures attributable to domestic waterborne transportation.

If current practices continue, including the statutorily scheduled tax-rate increases, the Inland Waterway Trust Fund revenues may constitute less than 9 percent of the Federal expenditures attributable to inland waterways in 1985 and less than 7 percent in 2000 (under the medium-growth scenario). Further, the Federal expenditures attributable to Domestic Ocean and Great Lakes marine transport would not be covered by Federal user change revenues.

Urban Mass Transportation

Using the NTPSC baseline assumption, government subsidies to Urban Mass Transportation increase rapidly. In 1975 government subsidies were about 48 percent of the transit bill. NTPSC forecasts show the government subsidy increasing to 60 percent of the bill by 2000. The baseline assumption held fares per trip at a constant 1975 dollar level.

Federal, state, and local subsidies appear to be tracking reasonably well for initial stages of the 1975 to 1985 period with the NTPSC forecasts. However, the post-1985 period is of concern. Currently rail transit in less than a dozen cities consumes about two thirds of the Federal and a large part of the state and local subsidies for transit. Will additional exclusive guideway systems (e.g., light or heavy rail, downtown people movers) over and above those to which the U.S. DOT is already committed, be started? The question is largely a political one. As of 1979, five cities (Los Angeles, St. Paul, Houston, Detroit and Miami) are in the preliminary engineering phases of developing downtown people movers. All of these systems could be operating by 1985 after capital investment totalling approximately $450 million. Five other cities (Baltimore, Indianapolis, Jacksonville, Norfolk and St. Louis) are conducting feasibility studies for such systems at this time. Operating cost estimates for any of the ten cities would be highly preliminary at this stage, but tend to be low compared to less-automated systems. In current dollars, the five systems expected to be operational by 1985 could have combined annual operating costs of approximately $15 million.[42] Because no allocations of fare box revenues have been made at this time, these systems are not included in the overall transit accounts. With the exception of a light-rail system in San Diego, no new exclusive guideway systems are likely to be started without heavy Federal subsidy support. Such systems have high initial costs and farebox revenues almost inevitably fail to cover full costs, including a contribution to capital.

The NTPSC assumed that the state-reported transit programs (1972 to 1980) and plans (1972 to 1990) for the *1974 National Transportation Report* would be implemented as reported. A nationwide survey conducted in 1977 by the American Association of State Highway and Transportation Officials (AASHTO), of urbanized area transportation improvement plans for the 1977 to 1987 period, indicated many changes. Chapter 10 compared the NTPSC, *1974 National Transportation Report* and AASHTO estimates.

The NTPSC's assumptions for the period after 1990 create another concern. Lacking any survey of urban mass transportation intentions of urbanized areas for the time period, the NTPSC assumed each urbanized area would pursue a simple linear extrapolation of the program (1972 to 1980) and plan (1972 to 1990) reported for the *1974 National Transportation Report*. For many urbanized areas, particularly those that may complete their proposed rapid rail systems by 1990, this assumption may vastly overstate proposed urban mass transportation development. This in turn would mean that subsidies for the post-1990 period would also be overstated. This overstatement may be exacerbated further by the cut-backs in intended development some urbanized areas appear to have made according to the AASHTO survey.

Other aspects of NTPSC base-case assumptions are worth noting. The NTPSC assumed that fares per trip in constant dollars would remain constant (no fare increases). Average trip lengths were forecast to increase. Thus the average fare box yield per passenger mile decreases. The subsidy may be extremely sensitive to these assumptions. However, time and resources did not permit additional simulations to estimate this sensitivity.

The only variation in inputs to the model used to simulate and forecast urban transportation across scenarios was the difference in population between the medium-growth scenario and the other two. Thus there was almost no variation in costs and subsidies across the three scenarios. Table 99 therefore shows only the values for the medium-growth scenario.

MATCHING RATIOS

The Federal-Aid Highway, Airport and Urban Mass Transportation programs all require that Federal funds be matched by recipients. Those matching

TABLE 99. Forecast urban mass transportation government accounts, medium-growth scenario, 1975 and 2000 (millions of 1975 $)

	1985	2000
Operating Costs	−5,730	−8,140
Fleet Replacement	−1,042	−1,544
Cost Subtotal[a]	−6,772	−9,685
Fare Revenue	+3,082	+3,420
Overall Subsidy	−3,690	−6,265
Capital Subsidy	−1,042	−1,544
Operating Subsidy	−2,648	−4,721
Federal Share of Subsidy		
50% Operating	−1,324	−2,361
80% Capital	−834	−1,235

SOURCE: Unpublished TRANS G MODEL runs by Peat, Marwick, Mitchell & Co. for the NTPSC, 1978.

[a] This figure is less than shown in Table 82. The figures in this table were not increased to reflect trends in unit costs.

funds are the price paid by state and local governments for Federal categorical dollars. When, for example, the Federal share is set at 80 percent, a state may, in effect, secure four Federal dollars for one state dollar, provided the money is spent on a given category of project and the state's allocation is not exceeded.

In this case, a state wishing to optimize its funds might reasonably invest in projects in the particular category down to a benefit/cost ratio as low as 0.2 (discounting at the state's minimum attractive rate-of-return). Thus, high Federal matching ratios may encourage excessive investment in one category at the expense of more worthy investment elsewhere.

From the Federal perspective, assuming a fixed level of funds available, the greater the Federal matching share the less may be the breadth of Federal influence over state and local development and the less may be total spending in the category. If the Federal government contributed $1 billion on a 50%–50% matching basis, the span of its influence might cover $2 billion in development. On an 80%–20% basis its span of influence would be $1.25 billion. (Influence as used here means the ability to impose Federal requirements, such as equal-opportunity hiring practices, proper bookkeeping, information reporting, meeting of development-quality standards, or even enforcement of the 55-mph speed limit or environmental regulations.) Thus, as Federal matching shares increase, in many ways Federal power to influence specific projects funded may also increase as the Federal share of the cost rises, but overall influence decreases. Moreover, unless states fund additional projects without Federal support, total expenditures in a category may decline as a direct result of raising a matching ratio.

These effects help explain why state and local governments have generally advocated greater Federal matching shares. And the tendency in recent decades has been to increase Federal matching shares. For example, a law passed in 1978 increased the Federal share for Federal-aid rural primary and secondary roads from 70 percent to 75 percent.[43] A decade ago the ratio was 50 percent.[44] It should be recognized that small changes in the percentage matching ratio result in very large shifts in the funding relationship. A shift from 50 percent to 75 percent triples the Federal dollars available per local matching dollar.

Differing matching ratios may indicate the relative significance the Federal government attaches to different programs, but such varying ratios also tempt recipients to select programs on the basis of their own contributions rather than considering all costs. As matching ratios for Federal programs have increased, differences between programs have tended to diminish. If economic analysis is encouraged as a basis for resource allocation, then such analyses must reflect total costs, not just local expenditures. Except where a specific national interest dictates otherwise, equal matching ratios appear most desirable for Federal programs.

One way to increase total funding for any or all program categories without further burdening the Federal government would be to reduce the Federal share. This would give state and local governments a greater financial stake in Federal-aid projects and could possibly minimize losses caused by inefficient distribution of funds through Federal-aid processes.

IMPLICATIONS OF UNIT COST CHANGES

Forecasting, particularly where complex processes are involved, is often an iterative process. Such was true of the forecasting work of the NTPSC. One iteration has been completed. Changes in the unit costs of transportation were estimated in this chapter. The relative changes in price between competing modes thus estimated should result in changed distributions of activity among the modes. Time and resources did not permit calculating such changes in transport activities resulting from price differences to the year 2000. However, a number of implications are worth noting.

Air carrier and automobile unit costs are expected to decline. Competing intercity bus, rail passenger service and local transit costs are expected to increase.

In the over-100 mile passenger market, both air and autos could both be expected to gain ridership at the expense of bus and rail service. This assessment may not hold if government subsidies to intercity bus and rail services are raised above current levels.

In the under-100 mile passenger market, the decreased costs of auto use imply greater competition for urban mass transportation. As transit is already heavily subsidized, this implies greater subsidy if ridership is to be maintained.

In the over-100 mile freight market, both truck and rail unit costs in constant dollars are expected to increase by about the same percentage. Today, however, average truck costs per ton-mile tend to exceed rail costs for many commodities. Thus the same percentage growth may result in a widening gap between truck and rail unit costs. If this happens, rail freight service may become increasingly competitive with trucking.

The constant dollar costs per unit of rail service are expected to increase relative to those of domestic waterborne traffic. This implies some shift to water carriers where the two modes are competitive.

Finally, the constant dollar costs per unit of pipelines are expected to increase faster than truck, rail, or water prices. However, a large part of the cost increase appears to be explained by pipelines expected to be built in expensive locations (such as Alaska) where competition from other modes may be minimal.

OTHER COSTS

Transportation involves costs other than those of a financial nature. These costs, if they are not reflected financially, should be considered and accounted for in another way.

Just as the dollar payments summarized in this chapter are forecast to increase substantially in the future, so too are the expenditures of time. The ability to make detailed national scale travel time estimates is severely limited by the weaknesses in modal data on vehicle speeds, terminal delay times, and other elements. Thus comparisons of travel time changes over a period of years are more valuable for the relative changes they identify than their absolute time values.

Using speeds broadly typical of the modes employed in local and intercity travel (as summarized in Table 100), yields an estimate of 53 minutes per capita per day expended in travel activity in 1975. Of this amount, 37 minutes is attributable to local and 16 minutes to intercity travel. By the year 2000, given the changes in population and levels of travel activity per capita forecast in Chapter 9 *and assuming no change in typical travel speeds,* average individual travel time would grow approximately 50 percent to 79 minutes per day, 57 minutes for local and 22 minutes for intercity travel.

TABLE 100. Travel time expenditures, 1975 and 2000

	PMT[a] (Billions)	Speed[b] (MPH)	PHT[c] (Billions)	Hours/ cap.[d] (Annual)	Minutes/ cap. (Daily)
1975					
Local					
Urban Auto ..	753	23	33	154	25
Transit	57	8	7	32	5.5
Urban Subtotal	810		40	186	30.5
Rural	460	55	8.4	39	6.5
Total	1,270		48.4	225	37
Intercity					
Air	148	400	.4	1.9	.3
Auto	1123	55	20.4	95.3	15.6
Bus	25.4	55	.5	2.3	.4
Rail	5.4	60	.1	.5	.1
Total	1,301.8		21.4	100	16
ALL	2,571.8		69.8	325	53
2000[e]					
Local					
Urban Auto ..	1,470	23	63.9	246	40
Transit	110	8	13.8	53	9
Urban Subtotal	1,580		77.7	299	49
Rural	700	55	12.8	48	8
Total	2,280		90.5	347	57
Intercity					
Air	472	400	1.2	4.5	.7
Auto	1,830	55	33.3	127.9	21.0
Bus	31	55	.6	2.1	.3
Rail	6	60	.1	.4	.1
Total	2,339		35.1	135	22
ALL	4,619		125.7	482	79

[a] Passenger miles of travel from NTPSC forecasts, see Chapter 9.

[b] Speeds derived from TRANS Model Calculations and National Summary of Transportation Statistics, U.S. DOT.

[c] Passenger hours of travel equals PMT divided by speed.

[d] Hours per capita per year equals PHT divided by total population (i.e., 214 million in 1975, 260 million in 2000) from Chapter 9. An entirely different but compatible data set could be generated by partitioning the population approximately (e.g., apply only urban population to urban travel, rural to rural travel). Such an approach would not change the estimates appreciably.

[e] 1975 speeds.

The ability to forecast future speeds is limited. In estimates of capital needs for the 1974 *National Transportation Report,* states predicted that typical speeds in urban areas would decline by 1990 despite the considerable investment anticipated in facilities. The capital investments estimated in this chapter are lower than the states' and this implies a greater decline in speeds. The decline is corroborated by model estimates made for the year 2000 by the NTPSC. If correct, urban auto speeds will decline by more than 10 percent while transit speeds increase by over 3 percent. No estimates of changes in intercity speeds have been made, but an assumption of approximately constant speeds in each mode seems reasonable given forecasts of facility development, traffic growth and technological change. If one assumes constant speeds, travel times per capita in the year 2000 increase to 85 minutes per day, 63 minutes in local travel and the same 22 minutes in intercity travel.

Recognizing again that absolute estimates of travel time are subject to substantial error, comparison of the relative changes is still quite significant. Time spent in urban travel will grow by 65 percent from 1975 to 1990 due to more travel per capita and an additional 16 percent due to declining average speeds. Rural time in travel will increase 25 percent. Intercity time in travel is expected to increase 37 percent due to more travel per capita. No estimates of changes of time in travel in rural or intercity trips due to speed changes were made.

If changes in the value of time between 1975 and 2000 are considered, in accord with the dollar-equivalent costs of disposable income, the time changes indicated become even more significant. NTPSC forecasts show an approximate doubling of disposable income per capita in the forecast period (medium-growth scenario). If the value of time to individuals is accepted as highly related to income, this implies a doubling also of the value of time. Thus the cost to the traveler of time spent in travel in the year 2000 would be more than three times that value in 1975.

The next chapter summarizes the major issues emerging from the changes forecast to the year 2000 in Chapters 5 through 11, as an introduction to the policy recommendations and policy impact analyses of the NTPSC.

NOTES AND REFERENCES

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23. *American Shipper* 21 (February 1979), p. 21.
24. *Congressional Record* 124 (6 April 1978) p. S4965.
25. DOT, *Trends & Choices,* p. 292.
26. U.S. Federal Aviation Administration, *Financing the Airport and Airways System: Cost Allocation and Recovery,* Washington, D.C.: 1979, pp. 43, 46. (Hereafter cited as FAA, *Financing;* available through the National Technical Information Service.)
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28. See U.S. Department of Transportation, *The Status of the Nation's Highways: Conditions and Performance,* Washington, D.C.: September 1977. (Hereafter cited as DOT, *Status of the Nation's Highways.*)
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31. U.S. Department of Labor, Bureau of Labor Statistics (BLS), *Labstat Series Report,* Washington, D.C.: 19 March 1979. (Hereafter cited as BLS, *Labstat.*)
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Issues and Policy Resolution

III

Emerging Transportation Issues

12

INTRODUCTION

Early in its deliberations, NTPSC established a workplan with three major tasks: identifying present issues; projecting transport trends to the year 2000 to discover emerging issues; and developing policies to resolve the issues. The first NTPSC Special Report described 25 major issues that were identified through public hearings and expert opinion.[1] (These issues are listed in Appendix Table 62.) On the basis of forecasting and other research described in the preceding chapters, the initial list of 25 issues was sharpened to reflect anticipated changing trends and goals. As could be expected, some issues are likely to lose significance, others to gain, while new issues arise in the next 20 years.

Although the issues included all modes and markets, two dominant policy themes emerged. The first is the importance of pricing mechanisms to allocate scarce resources, in the context of competitive transportation markets, to determine the levels of transport service required by the U.S. economy. There appears to be no mechanism superior to market-determined prices to decide which modes should provide services and which services should be produced. Of course, prices should reflect environmental, safety, and similar external costs as well as the more immediate costs of resources used in operating and providing transport service. The second theme is for governments to avoid distorting transport markets, and to maintain the role of private enterprise when transportation is made a tool for achieving non-transportation goals. The NTPSC's investigations suggest that the use of transportation as a means to achieve public goals can produce unintended results, leading to inequitable treatment of transport modes and markets, and inefficient use of resources. Policy changes to meet emerging issues to the year 2000 should emphasize proper pricing mechanisms and the preservation of competitive transportation markets. The following ten issue categories describe the more important problems to be resolved by U.S. transportation policy through the year 2000.

EMERGING ISSUES

GOVERNMENT POLICY MECHANISMS

U.S. policy has long emphasized the role of private transportation, assuming that private industry is efficient, well able to manage various productive inputs, and readily adaptable to changing circumstances. However, since World War I, the trend has been toward extensive public involvement in transportation, including public ownership and operation. Proponents of government involvement argue that markets are imperfect and must be controlled in order to achieve good service and equity.

Transportation is perceived as a lever of general social policy. Private transportation is being pressed harder to meet social requirements, and in the absence of effective reimbursement to support social services, private providers may leave unprofitable markets. Government ownership has come to be regarded as an assured means of achieving social ends.

Primary issues to be resolved are ensuring that public purposes are met through the private sector without causing it financial harm. This might be done most effectively by directly aiding individuals or groups that require support, rather than serving their needs indirectly by aiding carriers.

Government policy rarely establishes specific, measurable objectives for its transportation involvement. Yet without objectives, it is impossible to determine whether resources are being applied effectively to meet goals. Programs cannot be evaluated. Government must be guided by quantifiable objectives whenever it is involved in a transportation market.

As an example, government has not had as an objective the uniform treatment of competing transportation modes. The result is that one government action may create the need for another, as in the case of intercity bus companies, which recently lobbied for and were authorized a subsidy to offset the effects of Federal subsidization of railroad passenger service. Such a decision is often more expedient than the alternative—to reduce subsidies and cut back services.

Government in the U.S. has not been under the same pressure as private enterprise to justify expenditures on the basis of profit. Thus government-provided or financed services may be priced below private market costs, while in actuality using more resources, even when beneficiaries could be expected to pay the full price. In such instances, users may benefit, but taxpayers suffer to the extent that costs—including lost corporate taxes that might otherwise result if the service were left to private enterprise—must be made up from general tax revenues.

Possible means to achieve efficient government involvement in transportation include limiting government to roles which are essential and cannot be performed by the private sector, and, if government involvement is necessary, choosing appropriate levels of government. Also important are proper selection and use of tools employed by government, among which are:

1. Publicity and "jaw-boning;"
2. Planning assistance;
3. Preferential treatment by government;
4. The power of eminent domain;
5. Grants of service franchise;
6. Regulation;
7. Financial assistance and taxation; and
8. Publicly provided services or ownership.

Government frequently applies these tools to competing transportation modes, in varying degrees and combinations, without apparent rationale. The issue is proper government policies that choose the least-intrusive government mechanism to achieve objectives.

ENERGY AND TRANSPORTATION

Threat of drastic curtailment of imported oil, on which the U.S transport system depends, the costs of conversion to domestic sources of supply, rising prices, and the environmental impacts of alternatives are all energy-related issues which will continue to be of great importance in years to come.

Crucial uncertainties in the next several decades concern the intensity and success of the nation's efforts toward energy conservation and methods of developing alternate fuels, as well as the physical and financial capacity of the U.S. transportation system to accommodate changing distribution patterns of future energy traffic in a cost-effective manner.

Major energy questions to be addressed include:

1. How can future transportation systems provide energy-efficient movement of people and freight in a balanced system at the least social and economic costs?
2. How can transportation demand be reduced to conserve energy without seriously impairing mobility?
3. What strategies may be employed to conserve existing transportation energy resources?
4. How may new transportation technologies or alternate sources of fuel be developed to maximize efficiency of new systems and provide adequate fuel supplies?
5. What are or will be the most efficient methods of delivering energy materials?

Federal policies are in effect that require motor vehicle fuel efficiency and regulate vehicle pollutants. Tradeoffs between efficiency and pollution are not fully known and the results of greater consumption of diesel fuels are uncertain. Other issues involve U.S. and foreign policies that affect petroleum fuel prices, and the relationship of such price developments to the further production of U.S. fossil fuels and the expansion of alternate energy sources. Will U.S. transport and energy policies be consistent?

Other issues concern explicit or implicit government policies toward the comparative use of energy in the residential/commercial, industrial, and transportation sectors. What will be the impact of allocating between sectors on traffic patterns, and the type of transportation required for the movement of energy? The collection of user fees from vehicles that consume gasoline and diesel fuels, but the exemption from tax of alternate fuels, may spur energy conservation but reduces revenues.

Because coal is expected to be crucial in providing an energy balance, and coal traffic represents a major source of revenue for railroads and waterway operators, policy issues affecting production, marketing, and movement of coal are extremely important. Various governments impose costs and delays on the development of coal resources. States affected by large-scale coal development, especially in the West, may be faced with additional costs. If states tax coal movements to recover their costs, this could add to the expense of coal mining and transport. The extent to which Federal policy can rely on free energy markets to provide the proper price signals to stimulate coal production, while ensuring that externalities are considered, is at issue. Will various transport modes, especially railroads, have the physical and financial capacity to meet the requirements for hauling coal? The answers can significantly affect regional and national supply and demand for coal. Transport cost, it should be noted, is the largest portion of the delivered price of western coal.

The NTPSC's forecasts highlight the interrelationships of transportation and energy markets, as evidenced in issues about the provision of synthetic fuels, increased use of coal, constraints on development of nuclear power and the development of an energy-efficient auto. As part of resolving such issues, careful assessment of energy and transport options is required. Decisions must be reached on such matters as government financing priorities, research and development (R&D) incentives, grants, demonstration plants and projects, selected tax preferences, and environmental or safety regulation.

GOVERNMENT REGULATION

The Federal government and some state and local governments define transportation markets and regulate entry, exit, prices, and traffic. Economic regulation lacks consistency. Federal regulation and its consequences vary between competing modes, and also between transportation in general and its alternatives, such as the transmission of electricity or telecommunications.

There is both variance and overlap in state and local regulation. Disparate forms of government control have greatly affected the size and nature of the present transportation system. Regulation has been blamed for some of the financial troubles of the railroads and for sustaining motor and air carrier prices at artificially high levels.

The net cost of regulation to consumers is virtually impossible to estimate, but Federal economic regulation costs may amount to billions of dollars annually. At any rate, perceived costs have no doubt contributed to recent pressures for the U.S. Congress and the regulatory agencies to institute regulatory reforms.

But will a reduction in Federal economic regulation simply be replaced by regulation at the state and local levels? The Federal role in reducing local regulations which conflict with national goals will be a major issue.

Governments have used regulation increasingly to achieve broad goals. Today Federal standards dictate methods for packing, labeling, and handling hazardous materials. Other social goals, such as equal-opportunity employment, are often pursued by imposing regulatory requirements as conditions for eligibility to receive Federal funds. The Federal government also uses or endorses regulations and standards set by others, such as international groups or private bodies. Government is involved in safety education, vehicle design and manufacture, operating rules, design and provision of rights-of-way, post-accident services, and accident investigation. Both private and commercial transportation come under its purview, because accidents are treated as social costs, affecting the community and society generally as well as the individual and the family. Issues about safety regulation and promotion are expected to continue, concerning the degree and nature of government intrusion, and trade-offs must be considered between increased public costs for enforcement and provision of facilities and services to enhance safety, versus increased transport operations costs. Specifically, emerging safety issues are expected to emphasize the following categories:

1. Qualifications and fitness of transport operators;
2. Physical conditions of vehicles and rights-of-way;
3. Methods of enforcement;
4. Hazardous materials handling; and
5. Provision of safer rights-of-way for transport operations.

Issues concerning air and water pollution, noise, and EIS procedures are expected to continue throughout the foreseeable future. The issues will become more important when, after about 1990, increased demand for transportation could offset environmental improvements, resulting in levels of pollution from transportation sources that level off, and then begin to rise.

Air pollution issues center on emission standards for vehicles, a requirement which could preclude development of energy-efficient engines, and the high costs of implementing pollution reduction measures. Solutions to unacceptable levels of pollution in many urban areas lie in the form of transportation control programs (including such measures as dedicated lanes, pricing, and park-and-ride facilities), which are either expensive or could result in government intrusion into what many citizens consider to be local or individual rights.

Emerging issues concerning noise pollution center around the cost of compliance to standards (such as with aircraft) and possible safety trade-offs.

Water pollution issues emphasize: containment of oil spills in ports and harbors; choosing suitable sites for spoils from the dredging of ports and waterways; the extent of liability of operators in the event of spills; and how port improvements are to be financed.

Primary issues focus on the degree, means, and even-handedness of environmental regulation of transportation. Many believe that the statutory EIS process as presently applied has afforded too much leverage to those who wish to inhibit development. Added costs and project delays are cited.

Opponents of detailed regulation to achieve social goals contend that it: necessitates costly administration; generates bureaucratic "red tape"; stifles innovation and competition; fails to recognize regional and other differences in costs and benefits; and therefore creates inefficiency. For example, a "maximum permissible" standard for a vehicle may become a design criterion, while more cost-effective alternatives are overlooked. Advocates of more regulation say that it is necessary for the protection of labor, consumers, and the public, and that it promotes an efficiency which otherwise could not be achieved.

GOVERNMENT FINANCE

Public financing of transportation is claimed to discriminate between competing modes and to lack consistency. In most cases, no systematic accounting of costs and benefits is required; thus, public investments may not always yield the maximum possible benefit.

Government financial support of transportation takes many forms, including:

1. Ownership and operation of transport services or rights-of-way at a loss, or at costs below what the private sector might incur;
2. Direct financing of transportation owned by others;
3. Selective taxation or tax relief;
4. Loans and loan guarantees;
5. Funding of research and development;
6. Funding of planning; and
7. Funding of professional education in transportation-related areas.

The Federal government has no multimodal criteria for evaluating its financial policies and programs. Nor is there any consistent basis for the allocation of funds between regions. Significant instances of inconsistency in government policies are examined below.

Federal aid to highways is supplied from user charges. User-charge revenues are placed in the Highway Trust Fund. That money is returned to the states according to a series of formulas, rather than on the basis of taxes actually paid into the trust fund by individual states. Federal aid does not reflect regional or nationwide benefits to be gained from expenditure. Thus, some states are subsidized at the expense of others, rural areas benefit at the expense of urban centers, and Federal funds may be spent inefficiently.

Urban mass transportation, on the other hand, is funded out of general tax revenues. Support comes from the public at large as well as from actual users. Much Federal money has been spent on rapid transit rail systems in fewer than a dozen cities. As these large and expensive systems near completion, the per capita distribution of Federal mass transportation funds may tend to equalize among urban areas. Some cities and rural areas, which also require passenger services, were largely neglected until 1978 when Congress appropriated limited operating aid for transit in these areas. Although the Federal government requires urban areas to submit analyses of alternative mass transit systems in order to receive capital assistance, funds are not allocated on the basis of these analyses. Benefits are cited, but it is unknown what level of expenditures they may justify.

The Federal government treats *rail passenger and rail freight* services differently. Commuter and intercity passenger service are subsidized out of general tax revenues. Amtrak deficits are expected to increase, even if routes are restructured. NTPSC research revealed few if any economic, environmental, energy conservation, or safety reasons for such subsidy—particularly when intercity buses must compete for passengers.[2] Federal aid to rail freight services is largely in the form of loan guarantees, loans, and preference shares, which may become grants in the event of default. The Federal government also funds rail research, development, and planning out of general tax revenues. Shippers and communities also benefit from Federal subsidies for the continued operation of uneconomic branch lines.

The Federal government provides financial aid in different forms to *domestic and international water carriers.* Federal aid to domestic operators includes facilities and services subsidized by the taxpayer. The Coast Guard provides safety-related and navigation services. The Army Corps of Engineers develops, maintains, and operates most of the inland waterways. It also develops and maintains port and harbor channels used by both domestic and international marine traffic. Federal assistance allocated for these activities exceeds half a billion dollars annually. Subsidized domestic waterborne freight service competes with rail service, which is relatively less subsidized, and with pipelines, which are virtually unsubsidized, in the movement of some bulk liquids.

The *merchant marine* is aided by shipbuilding and ship operating subsidies paid for out of general tax revenues and by various forms of tax concessions. The U.S. shipbuilding industry has suffered from overcapacity, an international problem for shipbuilding. The Maritime Administration funds marine research and development and operates merchant marine academies at public expense.

The Federal government supports *aviation* through subsidies and assistance rendered to airports and airways, direct subsidy of local air carriers and service to small communities, and funding of aviation research. The Federal government owns and operates most of the country's civil air traffic control, navigation, and flight information services. The Federal Airport and Airways Trust Fund finances the cost of facilities and equipment purchased by the FAA. The fund is supported by user charges, but does not cover many other Federal expenses for aviation, including: maintenance and operation of FAA facilities and services; civil aviation research conducted by the National Aeronautics and Space Administration; local airline service subsidized by the Civil Aeronautics Board; and weather service information provided by the National Oceanic and Atmospheric Administration. Some studies suggest that while user charges paid by commercial air carrier passengers and shippers approximate FAA service costs, general aviation receives an indirect subsidy equivalent to several hundred million dollars annually. If Federal policy and practice are not altered, this indirect subsidy will continue to increase.

Should government insure that industries such as those providing transportation have access to the capital needed for replacement and growth? If so, what means would be both effective and acceptable?

In the private sector, capital requirements are met by reinvesting profits, selling equity, leasing, or debt financing. A firm's access to capital is determined generally by its profitability. Government itself puts pressure on the market by offering investors tax-free bonds, loan guarantees, and other advantages. By taxing profits and regulating rates-of-return, government weakens the capacity of industry to compete for capital.

Demand for public investment is increasing, but U.S. population growth has slowed, suggesting that the demand for housing, schools, hospitals, and other such facilities may lessen. There may be pressures for increased capital in new energy and environmental programs. Uncertainties make it hazardous to predicate policy recommendations on presumptions of a general shortage of capital. Nevertheless, fair and impartial competition for capital resources is an issue.

Private industry in some instances has contended that Federal safety and environmental regulations have imposed added capital requirements at the very time when inflation and massive government borrowing have made capital difficult to obtain. Carriers have called for assistance in obtaining the funds they believe are necessary.

Higher profits, perhaps partially the result of recent regulatory reforms, have lessened concern for capital needs of the airlines, several of which have recently signed contracts in excess of a billion dollars for new aircraft.[3] But the railroad situation is different. Much of the industry is in serious financial condition, and is likely to remain so for some time. Federal relief in the form of loans, loan guarantees, and the purchase of preference shares has helped some railroads on the verge of bankruptcy, but few railroads are strong enough to attract the capital they need to maintain or improve service.

Growing capital requirements for U.S. transportation, combined with increasing foreign willingness and ability to invest in U.S. industry, may result in the emergence of a new issue: increased foreign ownership of the transportation industry.

HIGHWAY SYSTEM MANAGEMENT

Which levels of government should be responsible for funding various portions of highway "needs"? Traditionally the Federal government has limited itself to partial funding of capital investment in a limited portion of the nation's highways and roads. In constant 1975 dollar terms the share of Federal funding for highways has declined for more than a decade. Future issues concern the types and degree of funding for this purpose, and whether the Federal interest lies in achieving uniformity of conditions on all highways in the U.S., or only on a portion of the highway network, such as the Interstate System.

What should determine the level of highway services? Each alternative shown in Table 101 results in different requisite expenditure levels, intergovernmental responsibilities, distributions (among states and urbanized areas), and spending on functional classes of road. Each has limitations, and each requires substantially greater public highway revenues than the NTPSC anticipates will be available, based on projected trends and a continuation of current user-charge practices. As shown in Table 101, the difference in capital investment between the least and greatest investment is $170 billion (in 1975 dollars) for the 1976 to 1990 period; an even larger amount would be required for the 1976 to 2000 period. For example, the U.S. DOT "Basic" alternative estimates the expenditures necessary to continue today's general level of highway conditions and performance at $469 billion through 1990 in 1975 dollars.

All three alternatives and the NTPSC forecasts of highway travel are based on roughly the same 1975 to 1990 rate of growth in highway travel (equivalent to about a 2.5 percent annual growth in vehicle-miles). However, annual growth rates for the past decade, with few exceptions (notably the 1973 to 1974 oil embargo years), have exceeded 4 percent.

INTERNATIONAL TRANSPORTATION

Economic theory indicates that free, competitive world trade would benefit all nations. Many countries, however, have seen fit to interfere with trade. Cargo-sharing arrangements between nations have become commonplace. Some countries (including the U.S.) subsidize shipbuilding and merchant ma-

TABLE 101. Alternative notions of highway needs.

	1976–1990 Capital Investments (Billion 1975 $)	Comments
DOT "Basic"	$469	U.S. DOT did not compute results for each state. Needs defined by DOT and states may not agree. Partial, but inconsistent use of economic analysis.
1974 National Transportation Report	$512	Reported by individual states, therefore probably not based on a consistent rationale from one state to another. Underlying Federal rationale largely a projection of historical practice.
Economic Analysis	$322	Basic data reported by individual states, U.S. DOT performed analysis using common rationale and economic methods. States may not agree with defined need.

SOURCE: For local road and street estimates (all alternatives) see state-reported local needs from *Catalogue of Tabulations, 1974 National Transportation Study,* Washington, D.C.: U.S. Department of Transportation, 1975, File Table H089. Costs for the Interstate System (all alternatives) from *A Revised Estimate of the Cost of Completing The National System of Interstate and Defense Highways,* Communication from the Secretary of Transportation Transmitting a Revised Estimate of the Cost of Completing The National System of Interstate and Defense Highways, Pursuant to The Provisions of Section 104(b)5, Title 23, United States Code, 1st Sess., Committee on Public Works and Transportation, Committee Print 95–11, 95th Cong., 1st Sess., Washington, D.C.: Government Printing Office, 1977, p. 25. Arterials and collectors for the DOT "Basic" alternative, see *The Status of the Nation's Highways: Conditions and Performance,* Report of the Secretary of Transportation to the United States Congress, Pursuant to Section 3, Public Law 89–139, Committee on Public Works and Transportation, Committee Print 95–29, 95th Cong., 1st Sess., Washington, D.C.: Government Printing Office, 1977, p. 167. Arterials and collectors for the "Economic Analysis" from unpublished study performed by the U.S. DOT, as reported in *1972 National Transportation Report, Present Status—Future Alternatives,* Washington, D.C.: Government Printing Office, 1972, pp. 225, 226.

rines as a matter of national policy. Various countries restrict entry to their domestic markets and promote penetration of their own products into foreign markets. Two questions arise. First, to what extent should the U.S. buy only domestically produced goods? The issue has been particularly sensitive when, despite unemployment, public funds have been used to purchase transportation equipment abroad. A second question concerns the extent to which U.S. trade should be required to move in U.S. ships. Today, many military and foreign-aid cargos are required to be moved in U.S.-flag vessels.

Governments' persistent interference with free trade, together with forecasts of increasing U.S. overseas trade, indicate that international trade-related issues will grow and intensify.

PUBLIC TRANSPORTATION

Present urban mass transportation can be divided into bus and rail transit categories. In terms of ridership, both are almost totally government owned and operated. In the past decade, fares have not kept pace with costs of providing services, and Federal, state, and local subsidies have risen as a result. For example, Federal assistance for capital projects totaled about $2 billion in fiscal year 1978, and operating assistance constituted about 11 percent of the total transit operating bill of $4 billion in 1976. (Some 55 percent came from the farebox and the rest from state and local governments.) Increased authorizations are expected to bring the Federal share up to 20 percent in 1978.[4]

In the future, this gap between user revenues and costs is expected to continue, and possibly widen. With further shortfalls, current issues will intensify, raising such questions as:

1. Who should pay for urban transportation, and what should be the basis of payment?
2. How should the revenues be collected, and what mechanisms should be used to distribute the funds?
3. Who should receive the benefits of transit services?
4. What level of public investment do transit benefits justify?
5. How should costs be apportioned among local, state, and Federal governments?
6. Should the Federal share be paid from general revenues, or from a type of trust fund?
7. Is it better to pay subsidies to service providers so that fares can be kept low, or should higher fares be charged with subsidies paid directly to users?

Some observers believe the Federal government should increase its financial commitment to transit because improved service is believed to help solve energy, environmental, and other problems. Others contend that extensive Federal assistance is inappropriate because mass transit should be a local, not a Federal matter. Some believe the funds are inefficiently directed in their present form.

Selectively channeling demand to those modes and activities deemed socially desirable is rapidly becoming an inherent, though not always explicit, element of many public programs. One direction of current demand modification programs is to attempt to move passengers away from the private auto to rail or bus transit modes, thus implying a socially desirable modal choice. Other programs inhibit use of automobiles by permitting, or even creating, congestion in order to divert demand. Opponents view such projects as those which close freeway lanes to autos, giving buses and car pools exclusive rights-of-way, as an infringment upon mobility rights.

If government consciously constrains mobility as a by-product of channeling transportation into preselected modes, or fails to provide adequate facilities without analyzing the benefits and costs, the results could be dramatic changes.

Mobility rights for special populations is emerging as a national issue. This is due to several coincidental developments: growing recognition that a highly auto-oriented society is a disadvantage for those without access; increased public responsibility for transit services; more vocal and articulate user groups; and growing financial support of services for the transportation-disadvantaged.

Mobility rights questions have focused specifically on needs of the elderly and handicapped. Section 16 of the Urban Mass Transportation Act and other Federal legislation state that these groups have the same rights as other persons to utilize publicly supported mass transportation. Finding cost-effective ways to provide equivalent mobility to elderly and handicapped groups is a transportation issue with significant social overtones. Adequate mobility for these groups so that their daily needs and interests can be met (a transportation issue) has become a conflict over the right of access to existing and prospective transit, and thus a question of social values and civil rights.

Some of the handicapped also contend that specially equipped vans for on-call, door-to-door service separates them from society, in a manner that suggests a separate-but-equal philosophy, even though vans may provide superior service. However, public costs to make present systems accessible to all handicapped groups, particularly by retrofitting existing systems, will far exceed the costs of specially designed but separate systems.

The future of this issue will be affected by two factors. The first is that the attitude of the general public is unclear at present. As costs become known, both in dollar terms and in terms of services foregone, the general public will have to decide whether the additional costs are warranted, and whether any substantive mobility or social rights have been curtailed.

The second factor is the size, location, and character of the service populations. Only varying and partial statistics have been available to identify the location and numbers of the handicapped. Information is needed on those who could use "accessible" transit if provided, and who would use it as a matter of personal choice. Limited data indicate that beneficiary populations are quite small. There are no data which identify those who, although qualified by virtue of age or infirmity, may prefer and be able to afford means of transport other than those which are publicly provided.

Mobility needs of low-income persons, particularly the urban poor, have been the focus of government concern for some time. Part of the rationale for public support of transit is based on this concern. Mobility has been recognized as necessary for obtaining services such as education, health care, and employment opportunities, which are themselves perceived as rights.

Whether the concept of a universal right of mobility will be accepted depends on future resources and social concerns. The public sense of responsibility for the needs of the disadvantaged appears strong. But, as society focuses on the transportation needs of those disadvantaged by age, infirmity, or income, public policy has begun to question the mobility rights of the total population.

TRANSPORT TECHNOLOGY

In light of increasing costs of R&D and the risks associated with the introduction of innovations (such as alternative auto engines, electric vehicles, and advanced turbofan engines), primary technological issues concern the Federal government's proper role in traditionally private industries. These issues raise the following questions:

1. To what extent and for what purposes should R&D be publicly supported?
2. What is the proper balance of government support for high-risk basic research and near-term applied R&D?
3. How can the government encourage more private R&D?
4. Should commercial feasibility be emphasized during all phases of government-sponsored R&D and used as a primary criterion for decisionmaking?
5. What are the allowable economic trade-offs (e.g., antitrust, technology transfer) for joint development efforts, both domestic and foreign-domestic?
6. For what purpose and by what means should the government aid market penetration of advanced technology (e.g., attractive export-import loans for overseas sales, guaranteed government purchases as with electric vehicles, "Buy American" policies, and design standardization policies)?

The 1973 oil embargo, as well as gasoline shortages in mid-1979, dramatized the problem of energy supply, and caused fuel efficiency to become a strong motivation for technological change in transportation. Prime examples are: alternative auto engine R&D; electric vehicle R&D; and NASA's Aircraft Energy Efficiency Program.

Some efforts may have been directed without sufficient regard for future fuels or for obtaining maximum output for every dollar input. Rather than simply seeking vehicle fuel efficiency, should emphasis be placed on treating vehicles, fuels, and refineries as a system which can be optimized for efficient use of fuels? If so, how can the government direct this effort? What current regulations need to be changed to achieve this goal?

INTERGOVERNMENTAL RELATIONS

The provision of transport services today is characterized by a profusion of agencies, programs, policies, and regulations at all levels of government. The NTPSC identified 64 agencies with transportation responsibilities in the Federal government alone, and more than 1,000 policies and programs administered by these agencies.

Results of this proliferation can include inefficient government due to a lack of clear objectives, a lack of coordinated pursuit of objectives, or an inability to measure progress toward objectives. Multiple agencies with various narrowly defined goals often create programs that work at cross-purposes, thus nullifying potential progress.

Local and state priorities are often distorted by Federal funds available through a proliferation of categorical programs, which are often characterized by complex funding formulas and inflexible standards. Distortions can result from conscious Federal intentions to redirect local priorities toward national objectives, but criteria seem lacking to assure that program differences are the products of consciously structured tradeoffs.

At the Federal level, transportation goals frequently receive less priority than goals for other sectors, which may have resulted in a diminution of transportation efficiency and services. Failure to assess the impacts of non-transportation policies on transportation, stemming from an inability to perceive transportation's crucial role in society, has negatively affected national productivity and mobility.

Increased Federal constraint on local actions has accompanied the dramatic shift in shares of local expenditures from 58 percent by local governments in 1913, to only 17 percent in 1975, and a corresponding doubling of the Federal and state shares.[5] In particular, the large share of local expenditures attributable to Federal aid has shifted the relative government authorities and priorities. Without a reversal it can be expected that the issue of control will be characterized by greater Federal and state controls on expenditures in the name of fiscal responsibility, and by greater local demands for relief from constraints and red tape.

Direct local-Federal relationships in certain program areas create ambiguity in the responsibility and authority of states. This issue is exacerbated when increased state funding support is expected by local areas, while little state influence over how such funds are spent is possible, given the extent of Federal rules. States often believe they are in a superior position to use Federal aid to the best advantage in improving the welfare of all their citizens. States may resent the intrusion of the Federal government in revenue collection and expenditure.

ECONOMIC DEVELOPMENT AND LAND USE

Transportation investment can result directly in improved productivity and expanded employment over the long run. Transportation can affect ways in which regions and communities develop, but there is uncertainty in the relationships. A principal concern is whether transportation will be able to support economic growth and employment in the future. Undesirable patterns of development may result from the location of facilities and the placement of transportation services, and transportation planners have been criticized for failing to anticipate these effects. There are questions as to the extent that transportation can promote desirable development. A more crucial issue may be whether transportation should be used as a lever to achieve development goals.

The general availability of transportation diminishes the relative impact of new transport investment on development. Other factors, such as water and sewer services, the weather, the availability of local amenities, public policies, and development already in place, are equally or more influential. Transportation decisions can also become significant in a negative way; closing an airport, abandoning a rail line, or re-routing service may adversely affect the potential of a community or region.

SUMMARY AND CONCLUSIONS

Because issues are often symptoms of basic problems in the transportation system, success in formulating responsive transportation policies will require understanding and consideration of the overall structure of transport markets. Two key themes arising from the NTPSC's research into the general conditions of the U.S. transport system are the importance of using proper pricing mechanisms in transportation and the necessity of preserving competitive transportation markets.

A responsive, future-oriented policy should recognize and respond to the fact that transport issues are dynamic, being influenced by:

1. Changing trends in system capacity and service;
2. Changing trends in the values used to judge the adequacy of transportation; and
3. Developing issues and opportunities.

The NTPSC has reviewed changing trends, with the expectation of both resolving the issues and capitalizing on the opportunities presented by:

1. The value of mobility and trade in the economy;
2. Technological advances; and
3. Shifting institutional processes for comprehensive and responsive decisionmaking.

An effective, future-oriented policy will not only resolve issues, but will also recognize opportunities and provide the environment in which policy can be implemented. The next chapter presents the NTPSC's policy recommendations.

NOTES AND REFERENCES

1. National Transportation Policy Study Commission (NTPSC), *Current Transportation Issues in the United States,* Special Report No. NTPSC/SR–78/01, Washington, D.C.: 1978.
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4. American Public Transit Association, *Transit Fact Book, 1976–1977,* Washington, D.C.: 1977, p. 20.
5. U.S. Bureau of the Census, *Government Finances in 1974 and 1975,* GF 75, No. 5, Washington, D.C.: September 1976, Table 4.

Policy Recommendations

13

INTRODUCTION

This chapter details the integrated set of national transportation passenger and freight policies developed and recommended by the members of the National Transportation Policy Study Commission.

These policies are predicated on the following themes identified by the NTPSC:

1. National transportation policy should be uniform;
2. There should be an overall reduction in Federal involvement;
3. Economic analysis of intended Federal actions should be performed;
4. When the transportation system is used to pursue non-transportation goals, do so in a cost-effective manner;
5. Federal involvement in (including financial assistance for) transportation safety and research is required; and
6. Users and those who benefit from Federal actions should pay.

The policies are discussed in general terms under five functional categories. These categories, representing instruments of policy, are:

1. Regulation;
2. Ownership and operations;
3. Finance, pricing and taxation;
4. Planning and information; and
5. Government organization.

Within each category, specific policies are listed. For example, policies are recommended to establish the DOT as the focal point for integrated national transportation policy; to encourage energy-efficient transportation; to use modal trust funds to finance capital needs of transportation systems; and to provide better balance among transportation markets, modes, and regions.

The NTPSC policies are designed to reduce impediments to vigorous competition by eliminating outmoded economic regulations, although restraints on anticompetitive and predatory behavior using the concepts of antitrust law enforcement within zones of reasonableness (where other economic regulation does not exist) will be needed in transportation, as in other sectors of the economy. Increased emphasis on uniform and effective enforcement of requirements for safety and financial responsibility (including that required by insurance regulations), is recommended for all carriers through cooperative Federal, state, and local efforts. Modal trust funds are one means to account for revenues from proper user fees, while expenditures from those trust funds are to be carefully evaluated using proper economic analysis. Federal ownership or operation should be used *only* where the private sector or state and local governments cannot act to achieve specific national objectives. Even in these cases, Federal involvement must be as limited and temporary as is feasible.

Regarding planning, the NTPSC recommends a new emphasis on multimodal cooperation and coordination, and optimum development of integrated transportation facilities. Cost-effective support of transportation research and development is also stressed.

Finally, to permit more effective transportation policymaking, the NTPSC recommends a restructuring of government organization, including the DOT, the transportation regulatory commissions and certain congressional committees.

These policy recommendations, when taken together, are proposed as necessary improvements to the existing U.S. transportation system, to cope with new challenges at least through the year 2000. Favorable impacts (as detailed in the next chapter) are expected in eleven goal areas, should the NTPSC policies be implemented.

Although the policies do stress integration, coordination and the need to consider the U.S. transportation system as a whole, the policies also recognize the problems associated with individual transport markets (intercity, rural, urban and international), with passenger and freight transport, and with individual modes.

MAJOR POLICY THEMES

This section identifies several themes which have emerged from the work of the NTPSC. The common element of all the themes is that national transportation policy must consider the U.S. transportation system as an integrated, multimodal network for the best employment of effective policies to guide the U.S. through the year 2000. Policies should not be developed in isolation, as is too often the case today. For example, policies developed to help rail passenger service, through Amtrak, may work to the detriment of the intercity bus industry. Other important themes include the need for placing major reliance upon the private sector, reduced government regulation, equal government treatment between modes, more competition and improved efficiency and, where Federal involvement is chosen, for application of appropriate user charges and proper economic analyses.

A. NATIONAL TRANSPORTATION POLICY SHOULD BE UNIFORM

The NTPSC review of existing Federal transportation policies and programs revealed that there is no uniform set of policies to guide Federal actions, or to improve the performance of the private sector. Most policies or programs are individually directed at particular problems. Although most are well-meaning, both individually and collectively they have at times tended to frustrate the effective functioning of competitive markets. In particular the important question of intermodal transportation has received too little emphasis.

This is not to say that the same policy must be applied to each issue. Uniformity is not desirable for its own sake, because some special situations require special policies. Some decentralization of Federal program administration, for example, may tend to encourage healthy diversity. Nonetheless, policies should not work at cross-purposes.

B. THERE SHOULD BE AN OVERALL REDUCTION IN FEDERAL INVOLVEMENT

Federal involvement often is required to facilitate the U.S. transportation network. The NTPSC recommends that where the Federal government is involved, it should use effective tools to accomplish its objectives. For example, Federal financing has led to the successful construction of the Interstate Highway System. Unfortunately, some sections of highway (and many bridges) are experiencing rapid deterioration. Current revenues for the Federal Highway Trust Fund will not be sufficient to complete construction of the Interstate System, to build other needed Federal-aid highways, and to ensure that the states are able to prevent deterioration of the Federal-Aid System.

Despite an important financial role for the Federal government, the NTPSC believes that in many instances Federal involvement can be reduced, so that private enterprise can function effectively, supplemented with limited state and local government participation. The private transportation sector should be permitted and encouraged to meet changing economic and other requirements without being unduly restrained by Federal laws and rules that do not apply to other business sectors. This is especially true in the recently deregulated airline industry where mergers of air carriers should be treated by the antitrust standards traditionally applied by the courts to unregulated industries. The new airline legislation is founded on the concept that it is in the public interest to allow actions of the airline industry, including decisions to merge, to be governed by forces of the marketplace. Consistent with that premise, mergers of air carriers should be governed by the same standards that are applied to mergers of other firms. At the same time, other conceptual constraints of Federal laws and rules from which the transportation service industry is now exempt should also apply to the transportation industry.

It is recognized that, in most instances, competition provides the most efficient results. However, responsible individuals differ as to those situations where free markets do not work well, both in theory and in practice. The NTPSC developed recommended policies that give free markets "the benefit of the doubt." Where exceptions are believed to exist that may require Federal involvement to correct distortions, those advocating involvement are asked to support their proposals with meaningful evidence.

Where the Federal government is involved, it should evaluate its policies and programs frequently, to prevent outmoded regulations from unduly burdening the private sector and other levels of government. This new orientation of Federal policy is based on the perception that, for most transportation issues, public interest and private profit are consistent rather than opposed. In general the public interest is best served by decentralized private decisionmaking that adapts transportation services closely to customer demands. Generally, such a system is socially and economically more responsible than one involving centralized government decisions that respond largely to bureaucratic and political imperatives.

C. ECONOMIC ANALYSIS OF INTENDED FEDERAL ACTIONS SHOULD BE USED

In considering the inadequacies of major Federal policies, the NTPSC found that careful analysis of benefits and costs might often serve to focus Federal involvement on those issues where government could maximize its contribution. For example, alternatives analysis is required of major transit projects funded by UMTA. Analysis and studies are not curealls. However, the results are often of great value to policymakers, and may help to produce greater public benefits per dollar spent.

D. WHEN THE TRANSPORTATION SYSTEM IS USED TO PURSUE NON-TRANSPORTATION GOALS, DO SO IN A COST-EFFECTIVE MANNER

In some cases transportation policies are established by the government to achieve other national goals, including safety, environmental protection, energy conservation, regional development, export expansion and national defense. NTPSC policy recommendations seek to pursue such non-transportation goals with minimum impediment to free transportation markets. In pursuing these goals, care should be taken to retain as many market incentives for proper pricing, effective management, and improved labor and capital productivity as is practical. Departures from the most economically efficient alternative should be explicitly stated and quantified.

E. FEDERAL INVOLVEMENT IN (INCLUDING FINANCIAL ASSISTANCE FOR) TRANSPORTATION SAFETY AND RESEARCH IS REQUIRED

Federal involvement, including financial assistance, to insure safety in transportation seems to be among the few areas in which a Federal role, if carefully structured, can be beneficial. The Federal government can work with the private sector and state and local governments to gather and disseminate information, promote cost-effective safety measures, require insurance and financial responsibility, and use performance measures (rather than arbitrary standards) to preserve the greatest degree of personal freedom consistent with the rights of all persons not to be harmed by the illegal actions of others.

Support for research of national importance is another area that can benefit from Federal involvement. Such involvement should utilize grants, contracts and cooperative agreements with private research organizations, universities, other government agencies and the private sector.

F. USERS AND THOSE WHO BENEFIT FROM FEDERAL ACTIONS SHOULD PAY

Free markets operate on the principle that those who benefit must pay for the costs. When government provides costly facilities, benefits, or services, it too should assess charges that recover costs against users and others who benefit. In some cases, such as urban and rural transit and air traffic control, where benefits are widespread, it may be appropriate to assess a general tax to recover federally-incurred costs. When the private sector is called upon to provide mandated services, the suppliers' operating and capital costs should be recoverable from the agency or political subdivision mandating the service.

POLICY RECOMMENDATIONS

NTPSC policy recommendations are summarized in this section. The recommendations devolve from the themes listed above and are reported by the NTPSC's five functional areas. A brief summary is given of status quo policy and of recommended policy alternatives. Some specific examples from intercity freight, intercity passenger, urban, rural and international markets are shown in several tables that follow the functional-area discussions.

REGULATION

Status Quo

Federal regulatory agencies now administer a host of complex regulations affecting entry, exit, prices, routes, and quality of service. Such economic regulations have evolved over the years to become more extensive, yet with more exemptions and special privileges. Congress has moved to ease regulations for railroads (e.g., the 4R Act of 1976), and for air carriers (by first phasing in freight deregulation in 1977, followed by air passenger deregulation beginning in 1978). In some cases, regulatory agencies themselves have moved to relax such controls (e.g., the CAB) while in other cases, they have interpreted congressional policy in such a way that regulations are not relaxed, and may even be tightened (e.g., the ICC's response to the market dominance provisions of the 4R Act for railroads). An agency may simultaneously tighten some recommendations while loosening others (e.g., the ICC's Chairman proposed, in November of 1978, to reduce drastically many aspects of motor-carrier economic regulation).

Too often the consequences of Federal economic regulation appear to be more costly than, and out of proportion to, the abuses regulation is designed to prevent. Regulations reasonable at the time of their promulgation become inappropriate as the economy and competitive environment change. Many regulations are out of date, such as many of those still imposed on U.S. railroads and motor carriers.

Non-transportation goals are often pursued through regulations and constraints imposed on transportation providers and users. For example, the 55 mile-per-hour speed limit was established as a measure to promote energy conservation.

NTPSC Policies

The NTPSC strongly endorses regulatory reform. Over the long term, complete revision of existing Federal economic regulation of transportation should be accomplished. Revisions should be undertaken following careful but expeditious economic analysis of their consequences along with assurances that protect the public from possible adverse effects implicit in such revisions. Basically, such revisions should encourage efficiencies in operation and energy consumption and provide wider latitude in entry, exit, route choice, price, and quality of service by permitting firms to make their own decisions subject to general laws and rules designed to protect the public interest, such as energy conservation legislation, antitrust laws and insurance coverage. Transportation firms should be permitted to merge, however, subject to the same antitrust policy concepts as other sectors of industry, as a minimum, once regulatory reform is implemented. In applying antitrust policies, consideration is necessary for the interconnected, international, and interrelated nature of the transportation industry.

The National Commission for the Review of Antitrust Laws and Procedures has considered the effectiveness of U.S. antitrust policy in encouraging efficiency through competition for major sectors of the U.S. economy, including transportation. The Antitrust Commission's report favors substantial reform of the antitrust laws affecting U.S. transportation (e.g., repeal of the Reed-Bulwinkle Act which permits antitrust exemptions for rate bureaus). If the antitrust policies cannot be corrected, and made applicable to transportation, the NTPSC supports a limited role for specialized Federal evaluation of transport competition. For example, a reconstituted residual transportation regulatory body may still need to consider effects of rail and air mergers by applying new criteria that emphasize the need for plant rationalization or coordination projects and the desirable transportation benefits of such actions as end-to-end rail mergers and mergers between small trunk carriers.

The NTPSC believes that Federal licensing to assure the fitness of certificated carriers should be retained. Fitness should be the responsibility of a single residual U.S. transportation regulatory commission (which would replace existing Federal regulatory commissions), considering all modes using fair and equitable rules, but applying firm enforcement. For example, in the case of motor carriers the right to operate (as distinguished from the present requirement to obtain operating authority) would be conditioned upon demonstration of adequate insurance—covering public liability, property damage, cargo (for other than private carriers) and environmental restoration—and demonstration of payment of the Federal heavy-vehicle highway-use tax to state vehicle registration agencies. Collection would be a cooperative Federal and state effort financed in part by sharing the proceeds of the heavy-vehicle highway-use tax. For certificated motor carriers, adequate insurance (or proof of financial responsibility equal to that required by insurance regulations) should be a minimum of $1 million for a single occurrence, or some other minimum amount, sufficient to require periodic "on site" inspection by an insurance company. The minimum should be updated regularly. Non-certificated motor carriers and other modes would be subject to similar requirements.

Rules that are retained should be reviewed frequently and updated. Decisions of the residual commission should be accomplished quickly to avoid imposing costly delays on carriers and users. Consistent with the overall goal of regulatory reform, Congress should provide continuing oversight, as Federal fitness regulation relating to safety (as opposed to entry, exit, route and price regulation) is likely to be a continuing Federal responsibility. Duties of the residual U.S. transportation regulatory commission might include consideration of financial and safety fitness, mergers, some elements of rate regulations, predatory practices, energy, environmental matters, intermodal coordination and other matters that clearly require continued regulatory administration.

Regarding rate regulation, carriers should possess the right to raise or lower specific rates within an expanding zone of reasonableness without approval. Congress should define the zone, and as the zone expands each year, complete pricing freedom eventually will be achieved. Review of price changes within the zone should be made only when there is a complaint, and the burden of proof should be on the complainant. All rates within the zone would be subject to improved antitrust laws. Rates outside the zone would be subject to investigation and suspension as today.

Tariffs should be effective on notice and without suspension, although collective ratemaking would be exempt from antitrust laws only for carriers that can participate in the traffic. Rate bureaus should be prohibited by statute from protesting independent actions. Rate bureau meetings should be open to the public and voting records subject to the scrutiny of the residual transportation regulatory commission.

As an interim measure, special exemptions now granted to one regulated mode should be available to all. For example, railroads should immediately be granted the option of offering service to shippers of all bulk and agricultural commodities (not only fresh fruits and vegetables) under the same terms and conditions as can now be provided by water and motor carriers of bulk and exempt commodities. Contract authority for service and rates should be available to all transportation modes and carriers as it is to business generally. Contract rates of a bilateral nature should be encouraged which foster negotiated prices for specified time periods at agreed-upon levels of service. The ICC announced in November 1978 that it will permit rail contract rates. Yet, its actions to date have *not* provided contract rate making to railroads on terms equivalent to those permitted for other modes.

In the case of motor carriers, economic regulation should be rationalized to provide much more freedom for common and contract carriers to compete with private trucking by offering service and price options that are attractive to a variety of users. Where operating authority is required, the carrier should be limited to showing that it is fit, willing and able; demonstrating that the proposed service meets a public need (through shipper support); obtaining adequate insurance coverage (or self-insurance) to protect the public; and paying the Federal heavy-vehicle highway-use tax required of all motor carriers as noted earlier. Similarly, other restrictions that impose undue circuity or encourage empty back-hauls should be quickly eliminated. Where Federal safety regulations are required, more uniform enforcement among carrier classes may contribute to efficiency. In all transport sectors, carriers should be allowed to abandon uneconomic services. If it is determined that the public benefit requires continued service, the carrier involved should be fully compensated for operating and capital costs.

Where Federal policy provides reduced economic regulation of interstate carriers, state and local regulations should not be permitted to prevent the reforms from having their intended effects.

In sum, the common carrier obligation that underlies existing U.S. economic regulation of transportation should be interpreted to stress that no carrier has the obligation to serve *unless* compensated for its costs; users should pay for benefits received; cross-subsidy should not be used; and competition will almost always produce more beneficial results at less cost to society than will detailed Federal regulation. Where deregulation imposes undue burdens on certain users, limited, temporary subsidies may be required (e.g., Congress acted in 1978 to provide a 10-year subsidy program for smaller communities that might otherwise lose air service).

The NTPSC recognizes that transportation must accommodate other ends, and the transport sector must expect to adhere to certain non-transportation regulations, as does all industry. Where such regulations are imposed, however, renewed emphasis must be placed on producing the most effective result for the least cost; where it is determined that Federal intervention is necessary, the steps taken must be in order of their cost-effectiveness. This is not always true today. The National Highway Traffic Safety Administration (NHTSA) publishes its estimates of the relative cost-effectiveness of some proposed highway-related safety improvements. In the case of Federal Motor Vehicle Safety Standard 121, which mandated costly computerized braking systems for trucks and buses, the Supreme Court ruled that NHTSA had not properly considered the costs of achieving the mandated standard. The Court overturned the regulations.

Although Federal involvement in air traffic control is a legitimate exercise of Federal power, many other safety functions can better be pursued with less direct Federal involvement. An example is allowing evidence of proof of insurance coverage rather than using regulations strictly prohibiting particular actions. The Federal government should concentrate on improving the information available to carriers and users in transportation markets.

Regarding energy conservation, it is believed that deregulated energy markets with prices reflecting costs (modified with taxes where external costs are not reflected in market prices), together with free transport markets, will be the most efficient way to encourage energy conservation and development. More market reliance will gradually reduce the need for Federal regulations designed to allocate petroleum and to impose strict fuel efficiency standards, regardless of benefits and costs.

In the international market, where the U.S. cannot expect unilaterally to impose its antitrust laws on the rest of the world, international negotiating forums should be used to seek cooperative answers to common problems. For example, worldwide implementation of uniform standards for the transport of hazardous materials (such as those negotiated at the Inter-Governmental Maritime Consultative Organization) seems to be a much more effective mechanism to develop and promulgate such standards than would be a series of unilateral pronouncements or bilateral negotiations. Where bilateral negotiations are used, more reliance on the private market is favored (such as that reflected in a recent bilateral air agreement signed between the U.S. and West Germany).

Table 102 compares status quo Federal transportation regulatory policies with the new policies recommended by the NTPSC.

OWNERSHIP AND OPERATIONS

Status Quo

The Federal government now directly owns or operates several transportation facilities and services

TABLE 102. Regulation Policies[a]

ECONOMIC

Overall

STATUS QUO POLICIES	*NTPSC POLICIES*
1. Recent actions by Congress have favored easing economic regulations (e.g., air passenger and freight deregulation and railroad regulatory reform in the 4–R Act). Regulatory agencies themselves have moved, to varying degrees, toward deregulation. Many inequities remain among modes, however. (All)	1. Regulatory reform should be continued, with emphasis on achieving such goals as efficiency, adequate service and safety in a cost-effective manner. Remaining economic regulations should pertain to fitness of for-hire carriers. A residual transportation commission should administer the fitness regulations, developing rules for financial fitness (including that required by insurance regulations) consistent with congressional objectives. DOT should be responsible for developing rules for safety and health, and for administering Federal funds to promote equitable state enforcement of Bureau of Motor Carrier Safety and other safety standards. Emphasis on safety is necessary as safety regulations are not effectively enforced, and reduced economic regulation may remove some incentives to safe commercial operation. (All)
2. By executive order, a new Federal multi-agency council for regulatory review considers costs versus benefits of certain regulations in a general fashion, but most regulations seek to achieve only narrow, agency-specific goals. (All)	2. The residual transportation regulatory agency, as well as other government units, should analyze the costs and benefits of administering existing and proposed Federal transport regulations and estimate their direct and indirect impacts on the carriers, competing modes and users prior to issuance. The analyses should be completed expeditiously and become part of a public record. (All)
3. Much transportation in the urban market is exempt from Federal economic regulation within zones defined by the ICC and CAB. The zones are not uniform. (UP, UF)	3. In the short term, Federal regulation of local transportation should not be undertaken for any mode within a standard exemption zone. The standard zone could be defined as the SMSA or Standard Consolidated Statistical Area boundary, or more flexible boundaries could be assigned to particular urban areas if required by market conditions. In the long run, exempt zones would not be needed, given the other NTPSC regulatory reforms. (UP, UF)
Common Carrier Obligation	
1. The common carrier obligation is generally defined to require demonstration of a carrier's fitness, willingness and ability to serve the public convenience and necessity. Cross-subsidy is often used so that service is available to all. (All.)	1. The common carrier obligation to serve must be retained to assure the transportation network serves the entire nation, but common carriers should be assured an adequate return on otherwise uneconomic service which users and government units will pay to continue. Service, safety and insurance obligations should continue. (All)
Entry-Exit-Route Restrictions	
1. The ICC regulates motor carrier entry by issuing certificates to serve particular routes and to haul particular classes of commodities. The burden of proof is on the applicant to demonstrate that granting of entry is in the public convenience and necessity, although the ICC is considering reversing this policy. Agricultural commodities hauled by truck are exempt from ICC regulations under Section 203(b)(6) of the Interstate Commerce Act (49 U.S.C. 10526(a)(6)). Section 203(b)(5) of the IC Act (49 U.S.C. 10526(a)(5)) exempts agricultural coops from most ICC regulation. However, in 1968 Congress limited the percentage of non-farm, non-member traffic carried by coops to 15 percent to protect common carriers from unfair competition. The ICC acted in 1979 to deregulate rail movement of fresh fruits and vegetables, and through administrative action has acted to liberalize additional regulations affecting rail and motor carriers. For example, in the *Liberty Trucking Case* and in Ex Parte MC–55, Sub. No. 26, the ICC has acted to shift the	1. Greater entry/exit freedom for all for-hire carriers should be phased in. Entry decisions should be based on such positive considerations as improved competition, innovation and energy efficiency, in addition to existence and continuation of adequate service and consideration of rates to be charged. A residual commission would grant certificates to for-hire carriers based on the above considerations and fitness (including adequate insurance or proof of financial responsibility equal to that required by insurance regulations), safety and proof of payment of Federal heavy-vehicle highway-use taxes. The new policy would increase the burden of proof placed upon the protestant. For example, automatic entry subject to fitness and safety, would be granted to any motor carrier applicant that wishes to serve an effectively abandoned market, or a market for which dormant rights exist. (IF, IP, RF, RP)

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[a] Each policy is followed by a symbol that indicates its relevance to transportation in these markets: Intercity Freight (IF); Intercity Passenger (IP); Urban Freight (UF); Urban Passenger (UP); Rural Freight (RF); Rural Passenger (RP); International Freight (ILF); International Passenger (ILP); All Markets Freight (All–F); All Markets Passenger (All–P); and All Markets both Passengers and Freight (All).

TABLE 102. Regulation Policies—Continued

ECONOMIC

Entry-Exit-Route Restrictions

STATUS QUO POLICIES	*NTPSC POLICIES*
burden of proof in entry proceedings, so that a protestant must be carrying the traffic in question to have automatic standing to protest. (IF, IP, RF, RP)	
2. In contrast to rail abandonment, there are no direct exit restrictions for particular motor carrier routes, except possible loss of overall authority. (IF, IP, RF, RP)	2. Allow freedom of exit for motor carriers. (IF, IP, RF, RP)
3. Regarding railroads, current policies result in lengthy abandonment proceedings and, while adandonment is pending, decreased profit or increased deficits for the carrier. Further, until 1978, policies encouraged early requests for total abandonment of lines by making rail branchlines ineligible for subsidy until abandoned and approved as such by the ICC. Policies discouraged permanent use of such branchlines, or potentially profitable segments of such lines, by offering only a temporary subsidy program (also changed in 1978 by Pub. L. 95–607, which reauthorized the branchline program, although retaining the 3-year time limit for Federal assistance to a particular branch). (IF, IP, RF, RP)	3. For entry and exit controls that are retained, the decision to preserve service (such as on a low-density rail line) should be based on an analysis of the operation of the facility under review, such as the branchline. Such analysis should be required of the parties to an abandonment case before the residual commission, using data and methods of analysis established and monitored by the commission. The Federal executive role should be one of coordination among the affected parties, exploration of the potential for substitute service, and limited, temporary financial assistance to certain branchlines serving a national interest. Rail carriers in cooperation with state and local governments and private shippers should be encouraged to continue to operate potentially economic rail branchlines that are approved for abandonment by the residual commission. Limited, temporary Federal subsidy should be provided for this purpose, as is now the case. (IF, IP, RF, RP)
4. Regarding passenger transportation, the policy is to regulate air (CAB) and intercity bus and water (ICC) carrier entry by awarding certificates of "public convenience and necessity" to carriers found "fit, willing, and able" to serve. The CAB will expire in 1985, and regulations will be relaxed in the interim. Air passenger carriers may enter one new market per year (for three years) and can serve in areas where there is unused authority, on a lottery basis. Domestic air freight is deregulated. Certificated air carriers must obtain CAB approval to abandon routes until 1982. Intercity bus carriers do not need such approval from the ICC, although they may risk loss of overall operating authority. (IF, IP, RP)	4. Immediately, permit more route flexibility for intercity buses; retain existing and legislatively planned flexibility for air passenger services. As provided in Pub. L. 95–504, in the long run there should be entry and exit freedom for all air carriers so that adequate service will be provided by the more efficient carriers. This will be the case for the domestic air passenger mode beginning January 1, 1982, and has been true for domestic air freight since November 1978. The intercity bus industry should have similar flexibility. (IF, IP, RP)
5. U.S.-flag liners may participate in open conferences in ocean shipping. Some U.S. air carriers take part in the rate-setting functions of the International Air Transport Association (IATA), although the CAB recently restricted the latter activity. International routes are approved by the CAB subject to Presidential veto. (ILF, ILP)	5. After studying benefits and costs of alternative policies, legislation should be enacted to encourage rationalization of the international maritime market through multilateral negotiations. Additional U.S. measures might include closed conferences, cargo pooling, revenue sharing and limited rebating. The result might be to reduce excess capacity which has hurt U.S.-flag carriers and the entire world market. The air mode, in which the U.S. enjoys a preeminent position in the world, does not need such protection at present. (ILF, ILP)
6. Shippers' councils are prohibited by antitrust statutes. (ILF)	6. Allow shippers' councils in order to offset the market power held by conference participants. (ILF)
7. Jones Act provisions reserve all domestic and coast-wise trade for U.S.-flag maritime carriers. Similar legislation reserves domestic air routes to U.S. carriers.(IF, IP)	7. Keep the Jones Act intact in order to promote the viability of U.S. shipping for reasons of national defense. (IF, IP)
8. Fill-up rights are negotiated in bilateral air negotiations and generally granted on a reciprocal basis. (ILP)	8. In the long term, multilateral negotiations are preferable; in the interim, bilateral negotiations should be continued with emphasis placed on the benefits of competition. (ILP)

TABLE 102. Regulation Policies—Continued

ECONOMIC

Rates

STATUS QUO POLICIES	*NTPSC POLICIES*
1. For surface carriers, a rate is deemed just and reasonable by the ICC if it covers variable costs (by ICC definition). The two-year, ±7 percent rate flexibility authorized for railroads by the 4–R Act was little used, but has been renewed in a different form by Congress. Peak and seasonal rail rates are also permitted. Domestic air cargo rates are deregulated, and CAB regulation of passenger rates is being phased out. Oil and gas pipeline rates are regulated to varying degrees by the Federal Energy Regulatory Commission, while coal slurry pipelines remain under ICC jurisdiction. The ICC may reject proposed fare changes and set minimums, maximums and specific fares for intercity surface passenger carriers. Amtrak is exempt from such fare regulation. The CAB regulates air passenger fares; however, carriers are allowed 50 percent downward fare flexibility and may raise rates 5 percent per year without CAB approval (so long as the carrier does not hold a monopoly in the market in question). Subsidized air carriers are allowed to raise fares within a 100 to 130 percent range of the standard fare. (IF, IP, RF, RP)	1. Allow more flexibility for both upward and downward rate changes. All carriers should be permitted to raise or lower rates within expanding zones of reasonableness without suspension. These zones would be set by Congress. Rates that were predatory, preferential, or discriminatory due to market control or attempts to monopolize could be disapproved after hearings by the residual regulatory commission and, within the zone, anticompetitive practices would be subject to appropriate antitrust concepts and remedies. Outside the zone, present suspension procedures would apply. (IF, IP, RF, RP)
2. Although the FMC has no authority to suspend rates in the foreign commerce, it may reject, after hearing, rates which are so high or low as to be detrimental to the commerce of the United States. There are substantial time lags in concluding these hearings. Several countries have passed laws which make it illegal for their flag carriers to supply cost data to the FMC for these purposes. Congress acted in 1978 to impose special conditions on Soviet-controlled vessels, as obtaining cost information from this source has proved to be especially difficult. (ILF, ILP)	2. The FMC has been given the power to suspend rates of certain state-controlled carriers pending investigation and approval or denial of predatory or disruptive rates. If relevant data are not made available to the FMC, the agency should apply average cost figures in making its determination. For example, if Soviet data are not forthcoming, costs should be estimated by the FMC using the experience of other carriers. (ILF, ILP)
3. Water carriers of bulk commodities and motor carriers of exempt commodities are not regulated, but railroads that carry most such commodities are. (IF, RF)	3. Immediately, exemptions should be eliminated or extended to all modes on equal terms. (IF, RF)
4. Contract ratemaking is not available to all regulated modes on equal terms. (IF, RF)	4. Allow contracts for services and rates for all modes on equal terms. (IF, RF)
5. ICC-determined rental rates for rail freight cars have been aimed at generating enough revenue to cover historical costs of car ownership, not at promoting optimum investment in freight cars or optimum allocation of existing cars. ICC car service rules regulate empty car movements. (IF, RF)	5. Eliminate ICC control of car service matters, such as: ownership, allocation, movement, and settlement, car rental, rates, leasing, per diem, and demurrage, permitting industry standards to apply, and encourage pricing flexibility subject to antitrust prohibitions where economic regulations do not apply. (IF, RF)
6. Air freight rates are deregulated and the CAB has ended waiting periods before applying a tariff. (IF)	6. Study the competitive impacts of air freight rate deregulation for application to other modes. (IF)
Rate Bureaus	
1. Rate bureaus or conferences, for the common carrier freight and passenger modes, establish rates under antitrust exemption, subject to approval of the ICC, CAB and FMC. The ICC has generally approved industry rate requests, although sometimes reducing their levels. Its entry, rate and contract carriage rules discourage rate flexibility by regulated carriers. Recently, the ICC has been reluctant to approve many rate increases filed by carriers through rate bureaus. The CAB has discouraged international tariff-filing activities of the International Air Transport Association. (All)	1. Rate bureau procedures need to be made more responsive to shippers, carriers and the public. Only carriers that can participate in the traffic, or who represent carriers that can participate, should be permitted to vote. Rate bureaus should be prohibited by statute from protesting independent actions. Rate bureau meetings should be open to the public and voting records subject to the scrutiny of a residual transportation commission. (All)

TABLE 102. Regulation Policies—Continued

STATUS QUO POLICIES	NTPSC POLICIES
ECONOMIC	
Quality of Service	
1. Federal policy stresses provision of adequate service to users already enjoying service, but does not necessarily promote new service to all areas or persons. (All)	1. In general, quality of service should be the responsibility of users, providers and beneficiaries, rather than the Federal government. Federal transport service standards should not be established, except as they relate to safety or to achievement of a specific Federal objective (e.g., rights-of-way to military bases in rural areas). If such standards are used, the Federal government should pay for additional costs via line items in budgets of the Federal agencies responsible, so as to avoid hidden subsidies. (All)
Intermodalism	
1. Jurisdictional disputes between Federal regulatory agencies exist, as do disagreements over joint rates and differences in liability limits and requirements. There are also limits on intermodal ownership. Specifically, railroads are subject to ICC restrictions with regard to ownership of other modes, while motor carriers, barges and pipelines are not. Regulations also inhibit intermodal service. However, the ICC and FMC recently signed an agreement promising closer cooperation. (All)	1. Eliminate Federal impediments to common ownership and intermodal coordination and cooperation, and promote effective joint rates and through service within and among modes. Some restraint on common ownership may be necessarily continued where the result is strongly anti-competitive. However, where such benefits as probable energy savings resulting from common ownership are high, energy considerations should be weighed against any anticompetitive effects. A common definition of "through bill of lading" should be adopted by Federal agencies, and differences between ICC, CAB and FMC regulations affecting through rates should be eliminated. Cargo liability laws should be further standardized. The U.S. should seek to write into law through international treaty and other means simpler, more uniform international documentation and liability requirements. These improved procedures might include pre-clearance (using satellites) which, if adopted on a multilateral basis, should improve service. (All)
2. Federal economic regulation may stifle innovation. For example, the ICC delayed the introduction of "Big John" hopper cars and other rail innovations such as cost-based pricing of unit train services. (All)	2. Federal regulatory impediments to innovation should cease. The private market should be encouraged to adopt new technology where cost-effective (e.g., multimodal services like TOFC/COFC). New technological advances should be adequately tested before they are approved for implementation. Remaining Federal regulations should be used actively to increase the cost-effectiveness of transportation through technological innovation (e.g. improved design of energy transmission, and maintenance of rights-of-way or vehicles). (All)
Mergers—Bankruptcy—Financial	
1. Mergers have been viewed by the ICC as a means to revive failing rail firms (i.e., ICC promotion of a "strong-road, weak-road" combination). (IF, RF)	1. The benefits of a rationalized rail system should be carefully weighed against lost competition and possible costs to shippers or labor interests, using proper economic analysis. Rail mergers, just as those of other modes, should be deregulated and made subject to improved antitrust laws, although in the interim the residual commission might apply merger criteria that stress plant rationalization. In the case of railroads, DOT should participate in the merger process to establish any important aspects of rationalizing present systems, including the encouragement of end-to-end mergers. (IF, RF)
2. Both the ICC and the courts participate in reorganization and abandonment proceedings. (IF, RF)	2. No change until NTPSC exit provisions become effective. (IF, RF).
3. Carriers allege that the ICC in the past has not acted on requests for mergers between carriers in a timely manner and discourages mergers between modes which might help transport efficiency. (IF, RF)	3. The Federal government should permit mergers, consolidations and transfers between carriers and among modes (including non-transportation firms), as long as they do not substantially lessen competition. They should be treated in a timely manner subject to antitrust laws. (IF, RF)

TABLE 102. Regulation Policies—Continued

STATUS QUO POLICIES	*NTPSC POLICIES*
ECONOMIC *Mergers—Bankruptcy—Financial*	
4. The ICC regulates financing decisions of surface common carriers, while the CAB does the same for air carriers. (IF, IP, RF, RP, ILF, ILP)	4. Regulated carriers should be subject to the same financial regulations as those of other sectors, administered by the Securities and Exchange Commission, while for all sectors, the amount of duplicative paperwork should be reduced. The residual transportation commission should collect such financial data as are necessary to accomplish its role. (All)
OTHER *Truck Size and Weight*	
1. Truck and truck-tractor length limits vary from state to state. (There are no federally specified limits.) Weight limits (gross vehicle and axle) are also set by states. The Federal-Aid Highway Act of 1975 authorized states to increase maximum weight limits from earlier limits set in 1956, to 20,000 pounds on single axles, 34,000 pounds on tandem axles, and 80,000 pounds gross weight on the Interstate System. A grandfather clause was attached. Several states in the Mississippi Valley have kept their limits on the Interstate System below the Federal maxima. Western and eastern states typically have set limits at or above the Federal weight maxima on their own highways (non-Interstate). (IF, RF)	1. States should retain their rights to set standards. The Federal government should work with the states to study the economic and safety impact of varying state length and weight limits. If significant benefits in excess of costs are found from a more uniform Federal standard on the Interstate System (or a segment of it), the Federal government should work with the states to accomplish such standards, accompanied by proper user fees for the highway system to recover maintenance and capital costs. (IF, RF)
Labor and Management	
1. Provisions of the Railway Labor Act attempt to minimize the likelihood of work interruption through government intervention in rail and air disputes. The IC Act requires that the ICC provide for labor protection when granting merger approval. The 3–R Act authorized lifetime protection for Conrail employees. (IF, IP, RF, RP)	1. Management and labor cooperation and flexibility should be encouraged to facilitate productivity gains. (All)
Safety	
1. Responsibility for promulgating and enforcing Federal safety standards and investigating accidents varies by mode and function, with consequent duplication, some gaps, and unequal treatment of modes. There are safety regulations for vehicles, for hazardous materials, for rights-of-way, and for vehicle operators. (All)	1. Needed are increased Federal preventive efforts, more equitable and cost-effective safety standards, and penalties for not enforcing or complying (e.g., better rural road/bridge maintenance; better track, rail car and truck maintenance; and better training of police and firefighters on how to deal with hazardous materials when there is an accident). If Federal funding (including loans) is necessary to achieve safety standards in an expeditious manner, costs should be shared by all levels of government, the carriers, users and the public. Cost-effective standards and regulations should be applied for all modes and carriers. As an example, all certificated motor carriers operating upon the highways should be obligated to carry adequate insurance (or proof of financial responsibility equal to such insurance) to protect the public. The insurance should cover public liability, property damage, cargo and environmental restoration—with a $1 million minimum for single occurrence, or another minimum amount sufficient to require periodic "on site" inspection by an insurance company, with the minimum to be updated regularly. Noncertificated motor carriers should be subject to similar standards. (All)
2. The provision of insurance has been and continues to be a function of the private sector. However, the inability to obtain insurance, or to obtain it at a reasonable price, is a growing problem for intercity buses, taxis, and specialized public systems in rural areas. Insurance problems inhibit mobility, delivery of social services, and transport innovation (e.g., para-transit alternatives). (IP, RP, UP)	2. States and local governments and the private sector should be encouraged to work with the Federal government to solve insurance-related problems. (All)
3. In some instances, motor carrier owner-operators have not had sufficient insurance or funds to cover the costs of accidents. ICC financial requirements only apply to regulated carriers. Safety regulations pertaining to drivers' hours	3. The Federal government should require that safety regulation be cost-effective relative to other life-saving programs, and that objectives be clearly stated. Performance standards and incentives should replace government attempts

TABLE 102. Regulation Policies—Continued

STATUS QUO POLICIES	NTPSC POLICIES
OTHER	
Safety	
of service and truck condition are promulgated and enforced by the DOT's Bureau of Motor Carrier Safety. FRA sets standards and regulations for rail safety. FAA sets such standards for air freight and passenger aircraft and service. The Coast Guard sets standards for water carriers. DOT sets standards for hazardous materials transport in general, including pipelines. No Federal-aid highway project can be approved for states which allow highway speeds in excess of 55 mph. Passive restraints are required in autos beginning in 1981. The Federal government sets other auto performance and safety standards and requires recalls of defective autos and equipment (e.g., windshield defroster standards, and bumper standards). (All)	to mandate specific safety technologies. Non-quantifiable benefits and costs, such as the intrusion into personal lives by Federal regulation, should be considered. Strict and effective enforcement should be used. All motor carriers should be required to carry adequate insurance (or proof of financial responsibility equal to the insurance requirement). For certificated carriers, failure to maintain safety or insurance requirements should be grounds for forfeiting Federal interstate operating permits. DOT's central role in safety regulation and enforcement should be retained. (All)
4. Recently, greater emphasis has been placed on Coast Guard vessel inspections. Foreign policy considerations have overriden the enforcement of standards on occasion. DOT may forbid entry of particular vessels into U.S. waters for reasons of safety prior to Coast Guard inspection (begun in 1978). (ILP, ILF)	4. The U.S. should ratify standards such as IMCO standards regarding safety (vessels and containers) and pollution for carriers engaged in international trade. Measures should be enforced through Coast Guard boarding of vessels and testing of crews. Embargoes should be used to encourage cooperation. Existing Federal insurance funds to cover oil spills, financed via a per-barrel tax on oil, should be broadened by establishing a single Federal fund preempting a multiplicity of state funds. (ILP, ILF)
Energy	
1. Numerous Federal controls are imposed on all segments of the energy sector. For example, within congressional limits, NHTSA sets standards covering the average fuel economy of new car fleets for automobile manufacturers. (All)	1. Free energy markets should provide the proper incentives to producers and carriers to use fuel-efficient vehicles and practices. Retain fuel efficiency standards until such free energy markets can be achieved. (All)
Environment	
1. Federal environmental protection policies comprise a large, complex and growing body of law and regulation. For example, FAA sets noise emission standards for aircraft. EPA sets noise emission standards for rail, motorcycles, trucks and intercity buses. No noise standards are set for automobiles at the Federal level. Air emission standards are set for new automobiles, trucks, buses and aircraft, but not yet for rail. State and local laws often cover the rail mode and can apply to other modes. Increasingly, environmental protection seems to delay or eliminate transport projects. (All)	1. Where Federal environmental regulations are imposed, the free market should be allowed to work and prices (fares and rates) permitted the flexibility to recover the cost of meeting these regulations so that users of the system share with the general public the cost of averting degradation of the environment in proportion to benefits received. Regional differences should be considered in preventing and correcting environmental degradation. The Federal government should help provide the following: (a) Monitoring of environmental conditions; (b) Environmental information clearinghouse; (c) Mediation of interstate disputes over environmental regulations; and (d) Catastrophic response planning. Actions should be coordinated by designating a lead agency, probably DOT. (All)

(e.g., Corps of Engineers' dredging, FAA's air traffic control system, the Alaska Railroad, plus National and Dulles Airports) and indirectly controls others (such as the St. Lawrence Seaway Development Corporation and Amtrak). Federal funds also are used to permit other levels of government to own or operate transportation facilities or services (e.g., highways, urban transit, selected rail branchlines and airports). Federal funds have been provided to Conrail, a private, for-profit railroad corporation created by Congress to provide vital rail service in the Northeast, following the bankruptcy of several northeastern railroads. These Federal funds for Conrail are to be repaid, or the Federal government will be the ultimate owner of the Conrail properties.

Federal policies also affect private ownership. The ICC has discouraged multimodal ownership and operations (such as rail and truck combinations), and often has delayed or prevented rail mergers by imposing restrictive conditions to protect other rail carriers and by ordering inclusion of other carriers in the merged company.

NTPSC Policies

The NTPSC recommends that national policy stress private ownership and operation of transportation, and that the Federal government become involved in ownership or operation only following careful consideration of alternatives. For example, Amtrak's route system is too extensive to pose any opportunity for break-even rail service, nor does it, in its present form, contribute much toward the numerous non-transportation goals (employment, safety, energy conservation, environmental protection) for which it was created. Amtrak should be refocused to achieve more cost-effective performance. Amtrak should cut back substantially its long-haul routes to concentrate, in the short run, on reducing its deficits by serving dense corridors, and in the long run on providing only that service which is determined to generate long-term benefits to society in excess of resource cost. Regarding Conrail, every effort should be made to insure that Conrail does become profitable, and that Federal aid is, in fact, repaid. The regulatory reforms recommended by NTPSC should serve to increase the likelihood that Conrail will succeed.

Table 103 shows status quo ownership and operations policies in more detail, compared to NTPSC policy recommendations.

FINANCE, PRICING AND TAXATION

Status Quo

The NTPSC staff found that *substantially more* than the $18 billion identified in the fiscal-1979 combined transportation account of the Federal Budget is available for use for transportation-related purposes at the Federal level each year. The total amount available includes direct transportation grant programs, loans and loan guarantees, as well as several programs used primarily for non-transportation purposes (but with some portion expended for transportation).

Congress has provided capital grants for urban transit systems since 1964, and operating assistance since 1974. In 1978, Congress increased this assistance. For example, Congress acted to extend transit financial aid to small urban and rural areas, to increase the levels of funding, to authorize aid to intercity buses, and to add new transit allocation formulas so as to direct more aid to the largest transit systems.

In the case of highways, a trust fund is used to account for collections of user taxes imposed on such items as fuel, lubricants, vehicles and parts. Numerous exemptions are given, the most recent (in 1978) to intercity buses and taxis. Revenues are allocated from the trust fund in several categories using various formulas. The money may be used by states for major rehabilitation-type work, in addition to new construction.

Trust-fund receipts are used to fund scores of categorical highway-aid programs. A similar trust fund is used to account for grants for airport construction. Federal revenues sufficient to fund future U.S. highway requirements (those justified by proper economic analysis) will not be available unless Federal user fees are increased.

Congress set up a new Inland Waterways Trust Fund in 1978 to account for the fuel-tax collections to be paid by users of the Federal waterways, to

TABLE 103. Ownership and Operations Policies[a]

STATUS QUO POLICIES	*NTPSC POLICIES*
1. There is no Federal ownership or operation of rail facilities or rights-of-way except the Northeast Corridor (owned by Amtrak), the Alaska Railroad, and certain defense installations and rail cars. (IF, IP, RF, RP)	1. Status quo policy should be maintained with regard to private ownership of rail rights-of-way and equipment. Amtrak should be refocused to achieve more cost-effective performance. (IF, IP, RF, RP)
2. The FAA owns and operates two airports, and the air traffic control system, including 25 air traffic control centers, control towers at 426 major airports, and 328 flight service stations that transmit weather and other information to pilots and traffic control data between ground controllers and pilots. (IF, IP, ILF, ILP)	2. The NTPSC supports cost-effective FAA proposals to upgrade the air traffic control system, although this recommendation is not a specific endorsement of recent FAA proposals to expand the positive air control area. (IF, IP, ILF, ILP)

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[a] Each policy is followed by a symbol that indicates its relevance to transportation in these markets: Intercity Freight (IF); Intercity Passenger (IP); Urban Freight (UF); Urban Passenger (UP); Rural Freight (RF); Rural Passenger (RP); International Freight (ILF); and International Passenger (ILP); All Markets Freight (All–F); All Markets Passenger (All–P); and All Markets both Passengers and Freight (All).

TABLE 103. Ownership and Operations Policies —Continued

STATUS QUO POLICIES	*NTPSC POLICIES*
3. Corps of Engineers' dredging activities, and locks and dams, serve ports and waterways. (IF, IP, RF, RP)	3. The NTPSC supports studying the benefits compared to the costs of users paying directly for Corps of Engineers services, including administrative costs of collections, as directed in Pub. L. 95–502. (IF, IP, RF, RP)
4. Federal motor pools are managed by GSA and DOD, and transportation facilities on Federal lands are managed by USDA and DOI. (IF, IP, RF, RP, UF, UP)	4. More coordinated use of Federal vehicles and transportation facilities on Federal lands, especially during times of emergency, should be sought. (All)
5. Federal-aid highways and most other highways are publicly owned, although not by the Federal government. (All)	5. Federal highway ownership should not be expanded, unless benefits exceed the costs of doing so. Private alternatives to some existing Federal involvement should be considered. (All)
6. DOT and HEW funding encourages ownership and operation of transportation services by public and private nonprofit organizations rather than contracts with private, for-profit operators. Problems related to program boundaries, eligible uses of funding, reporting requirements and insurance discourage private operation and coordination between specialized transportation systems. (IP, RP, UP)	6. Federal regulations and funding should encourage private ownership and operation of transportation by relying on the marketplace. If this fails, prior to initiating a new system the least intrusive Federal methods should be pursued. Possibilities include: direct user subsidies; employing quasi-public corporations; and requiring state and local governments and agencies to use private providers to the greatest extent possible. (IP, RP, UP)
7. DOT programs for the urban disadvantaged emphasize carrier subsidies rather than user-side subsidies, and funds from HEW are frequently used to provide transportation by social service agencies for clients, rather than to subsidize clients' use of existing services. Such in-house provision of transportation is generally not coordinated and is also financed by UMTA in its section 16(b)(2) program. (UP, RP)	7. The use of Federal funds for in-house provision of transportation by any federally-assisted social service agency should be permitted only after due consideration of the private sector's ability to meet client needs [i.e., when no adequate service is provided at competitive prices by private (for-profit) suppliers]. DOT should be designated as the lead Federal agency to promote increased emphasis on private-sector provision of services and to promote coordination of in-house services that remain. (UP,RP)
8. In the analysis of sites for new Federal facilities, employee and user transportation costs are not always considered. (All)	8. Once an area for a new Federal facility is chosen, exact sites should be considered using methods that include transportation costs (both for supporting the installation and for its employees), so that undue burdens are not placed on local transport systems. (All)
9. The Federal government operates a Merchant Marine Academy. (IF, IP, ILF, ILP)	9. The Federal government should continue to operate the Kings Point Academy to provide an educational standard. To insure the continued availability of high-quality Merchant Marine officers, Federal funds should continue to go to state- and privately-operated Merchant Marine Academies. (IF, IP, ILF, ILP)
10. Regarding foreign ownership of U.S. modes— *Air:* 75 percent of the voting interest of U.S. air carriers certificated by the CAB must be owned or controlled by U.S. citizens. Two-thirds of the directors must be U.S. citizens. *Interstate Surface:* No requirements for identification and no restrictions on foreign investments in common carriers exist. *International Maritime:* In order to be eligible for Title XI guarantees, 51 percent of the voting stock must be held by U.S. citizens and 3/5 (or 4/7 under certain conditions) of the Board of Directors must be U.S. citizens. In order to receive Operating Differential Subsidies, 75 percent of the voting stock of the corporation must be held by U.S. citizens and the above rules hold on the proportion of U.S. citizens on the Board of Directors. In both cases a quorum of the Board must consist of a majority of U.S. citizens. All U.S.-flag vessels must be crewed solely by U.S. citizens. (All)	10. Do not permit ownership restrictions to unduly inhibit foreign investment in U.S. transportation facilities. (All)

begin in 1980. The fuel tax will rise to 10 cents per gallon by 1985, when it is expected by NTPSC to recover less than 20 percent of waterway costs.

The concepts of trust funds versus general-revenue finance, in general, and the use of a unified trust fund versus single-mode funds in particular, have been subjects of continuing discussion. Those favoring trust-fund financing argue that revenues from proper user fees must be earmarked for transportation purposes to avoid the use of such revenues for projects that would not benefit those who paid. Those favoring single-mode funds point out that these funds guarantee that user fees will be spent for transportation purposes, provide some certainty as to the future availability of revenues, and still permit some flexibility among categories and among modes.

In the international market, extensive Federal subsidies are available to aid U.S. shipbuilding firms and U.S.-flag maritime firms. Such subsidies are designed to preserve a U.S. shipbuilding capability and to ensure the viability of U.S.-flag carriers using U.S. crews. Subsidies are made to pursue such goals as labor protection, national defense and security, and balance in international payments. Another reason for such extensive maritime aid is that other countries are subsidizing their maritime sectors, so that it may be unreasonable to expect U.S. firms to compete against such subsidized carriers.

NTPSC Policies

Where Federal services are provided, the rule should be to assess taxes that reflect costs attributable to users. Thus, in special cases tolls for new and improved highway facilities, bridges and limited-use facilities could be applied. Such fees could be applied so as to permit a smoother flow of traffic during peak hours, or to permit longer and heavier trucks to operate where *all* incremental costs as well as an appropriate share of common costs are recovered. For example, industrial highways or specialized lanes could be built as toll facilities. The savings from being permitted to operate on these upgraded highways and bridges could out-weigh the expense of user fees.

Another possible application of the "user-pays" principle should be waterway tolls. Congress has acted to impose a fuel tax on waterway users. Any such fees paid should recognize that costs and benefits of waterways are based on multiple uses, such as recreation and flood control, as well as commercial transportation. No existing waterway segment should be shut down if users pay at least an amount sufficient to cover its operation, while considering matters such as regional economic development, export expansion, or other specific national objectives. In some instances such user charges would provide market tests to guide future investments. In many cases, congestion has been used as an argument 'for building new facilities. By using market forces, for example, more efficient use of existing facilities might reduce the need for extensive new investments.

The user-pays principle should also apply to the rail mode. While reorganization of the northeastern railroads is still in its early stage, Conrail as a private for-profit corporation should ultimately reach its objective of being self-sufficient. To accomplish this, it is essential that burdensome regulation of pricing and services be eliminated. Likewise, Amtrak should be placed on a paying basis.

Federal categorical spending to fulfill specific objectives should be based on careful economic analysis. Each Federal agency should analyze its own programs using common methods and assumptions, while an independent Federal agency (such as the General Accounting Office) reviews the results.

Federal and state governments should share with local governments the financial responsibilities of supporting urban transit. Flexibility and transferability among categorical programs should be encouraged. Aid should be directed at encouraging the development of a U.S. manufacturing industry for transit vehicles. Municipalities should be encouraged to establish consistent requirements and to purchase vehicles together in order to reduce costs, create jobs and otherwise support U.S. manufacturers.

Regarding the types and quality of services provided using Federal funds, as many private, state and local options as possible should be permitted, consistent with stated Federal objectives. For example, recipients of transit aid should be permitted flexibility in meeting the needs of elderly and handicapped citizens.

Trust funds have been the focus of considerable attention. The important issues are proper collection of revenues via user fees and proper spending of funds following careful investment analysis. The political appeal of revenues dedicated to benefit those who pay is strong. While retaining trust funds, care must be taken to subject taxing and spending decisions to careful analysis.

To help meet transportation infrastructure needs in the U.S. to the year 2000, given increasing demand and accelerating costs, together with differing regional needs and energy shortages, it is clear that Congress must adjust certain Federal user fees, perhaps, for example, by indexing Federal highway fuel taxes to reflect the rate of inflation.

In general, the new policies discussed in this section will result in more even-handed Federal taxing and spending among modes. The Federal government should also work to remove state and local impediments to free markets where they exist.

Current Federal policy provides no direct financial aid to international aviation. This policy should continue, with even more emphasis on "open skies" policies that will enhance the ability of U.S.-flag carriers to compete. The maritime sector is, unfortunately, a different case.

Federal maritime support which encourages a strong U.S. merchant marine and shipbuilding capacity for defense purposes should be retained. The support should seek the greatest benefits for the fewest Federal dollars, with the least intrusion in free markets. Specifically, the U.S. should seek to negotiate multilaterally a worldwide reduction in shipbuilding subsidies; impose dumping duties on foreign-flag carriers found to be selling below-cost transportation services in U.S. markets (with the revenues used to support U.S.-flag carriers); improve incentives for efficiency among recipients of Federal aid; and study cost-based user fees on all users of U.S. ports (or negotiate reciprocal agreements with other nations). As an alternative to continuing existing subsidies, the U.S. might consider instead using subsidies with built-in performance incentives in order to reduce subsidy levels. Another alternative is extending antitrust exemptions to U.S. carriers so that participation in cartels is possible, perhaps including closed conferences, cargo pooling, or cargo sharing agreements among countries (such as the United Nations Conference on Trade and Development's 40/40/20 proposal).

Whichever specific methods are chosen, Federal support for the U.S.-maritime sector is required.

Table 104 lists more detailed Federal status quo financial policies and compares these to the NTPSC recommendations.

PLANNING AND INFORMATION

Status Quo

In general, categorical planning programs are used by the Federal government, with little effort to publicize or integrate the results. Hard issues are not faced directly through federally supported planning. Instead, numerous separate programs, each individually influencing urban form, may be pursued (e.g., the Department of Housing and Urban Development's housing programs; the Department of Health, Education and Welfare, the Community Services Administration, and Action's social service programs; and the Department of Commerce's economic development grants all have been used for transportation purposes with no common planning required other than A–95 review).

Moreover, Federal grants have often ignored or omitted cooperative state and local planning.

Finally, planning by the Federal government for its own systems of interest has been limited. Although a national airport system plan is produced regularly, rail systems planning resulted only from the Northeast crisis, and no Federal port planning occurs, despite the apparent difficulties of financing new port development and the low rates of return that characterize many U.S. ports.

NTPSC Policies

Planning often has been feared as antithetical to free markets and as the first step toward intensive Federal involvement. Surely costly requirements for detailed planning using federally mandated methods for Federal purposes are to be avoided. However, Federal encouragement of careful and knowledgeable planning by states, local governments and the private sector is desirable. Where the Federal government believes there may be a need for its involvement, it too should plan how to accomplish its goals at the least cost and with the least disruption to the marketplace. Careful planning can provide an executive-branch management tool, yield information vital for congressional oversight, and enable progress toward objectives to be monitored.

Specifically, recipients of any Federal categorical transportation aid should be required to work with local groups to prepare short-term and long-term plans (using only general Federal guidelines as to what aspects should be considered, rather than detailed regulations on exactly how to plan) and to publish such plans. The Federal government should also encourage recipients of aid to perform multimodal planning at the state level.

The Federal government can also be an effective clearinghouse for information. It should seek to remove Federal impediments to the free flow of information and to determine the more important information needs that are not being met by the private sector.

Federal support for research and development is also required, not only because of the critical energy situation, but because major research may involve risks and economic considerations beyond the ability of the private sector. Federal impediments to innovation should be removed. For example, rather than forbidding joint research on emissions-control technology among private U.S. auto manufacturers, the option of such joint research should be offered to the firms, subject to careful scrutiny.

In assessing new technology for transportation, the NTPSC has recognized the need for more

TABLE 104 Finance, Pricing and Taxation Policies[a]

STATUS QUO POLICIES	NTPSC POLICIES
Overall	
1. The U.S. DOT and other agencies fund transportation infrastructure, systems and users at different levels and matching ratios. Funding includes loan guarantees, grants, tax credits and exemptions. Examples are: (a) Infrastructure: (i) Waterway construction and maintenance; (ii) Roads and bridges; (iii) Maintenance (3R—restoration, reconstruction and resurfacing) of the Interstate System; (iv) Selected rail lines; (v) Bicycle paths; (vi) Rail-highway crossings; and (vii) Airports. (b) Systems: (i) Operating assistance for specialized and public transit, intercity bus and rail carriers, and some trucks when there is rail abandonment; and (ii) Exemption from fuel and other Federal excise taxes for specialized systems, intercity buses, taxi and public transit. (c) Selected users: (i) Social service clients—no fare or reduced fares; and (ii) User subsidies in some DOT demonstrations and from HEW. (All)	1. (a) The Federal government should clearly identify its non-transportation and transportation objectives. (b) Users should be assessed charges that reflect the costs occasioned by their use, except where it is determined that federally-assisted transportation facilities serve non-transportation social and economic objectives. In some cases, non-users derive benefits or create costs and should be taxed to provide funds. (c) Economic analysis should be performed by the program agency(ies) prior to Federal financial assistance. It should be multimodal and reviewed by a separate Federal agency. Programs should provide minimal reporting requirements and be evaluated regularly, perhaps every two years. Financial assistance should permit recipients to: (i) Use incremental pricing where possible; (ii) Be free to manage with some accountability; (iii) Seek productivity increases; (iv) Use private-sector involvement to the greatest extent possible. (d) Funding should be: (i) Flexible (i.e., carriers, users, infrastructure and maintenance (3R–type) should be eligible); (ii) Predictable (i.e., available for a multi-year period) and; (iii) Provided in the most cost-effective way. (All)
Economic Analysis and Evaluation	
1. Although economic analysis is sometimes used to evaluate Federal investments, no common methods or assumptions are employed, and policy and program changes are rarely subjected to effective analysis. (All)	1. Effective economic analysis should be required of all existing and proposed major Federal policies, programs and regulations. The products should be reviewed by an independent agency, such as GAO. Care must be taken to apply the results of analysis in decision-making. The requirements should not be so complex as to add to paperwork burdens nor be used to delay worthwhile projects. (All)
2. Several competing goals are usually specified to justify individual pieces of Federal legislation. These are rarely useful for policy and program evaluation. Standards are often promulgated from these goals, and have gaps and conflicts as a result. (All)	2. For categorical Federal programs, evaluations should be made (by recipients) of proposed actions involving Federal-interest facilities. These evaluations should include: (a) Comparisons of quantifiable costs and benefits to the costs and benefits of alternatives (including "do nothing"); (b) Analysis of impacts on the marketplace; (c) Specification of actions necessary to lessen marketplace disruptions; (d) Analysis of adverse impacts by goal; and (e) Specification of a timetable for subsequent reevaluations of the action and specification of sunset provisions. (All)
3. Federal policies do not state objectives to be achieved, with few exceptions. One such exception is the Northeast rail corridor objective (to reduce travel time between Washington, D.C. and New York to 2 hours 40 minutes by 1981) that apparently will need more time and funds. (All)	3. Federal transport programs should operate with specified objectives so that program achievement can be measured and future funding determined on a rational basis, and so that the need for any continued Federal involvement can be determined. One means of developing objectives would be for Congress to enact legislation stating goals and then requiring the Federal agency involved to report to Congress within a specified period of time the exact objectives which can reasonably be achieved. To facilitate

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[a] Each policy is followed by a symbol that indicates its relevance to transportation in these markets: Intercity Freight (IF); Intercity Passenger (IP); Urban Freight (UF); Urban Passenger (UP); Rural Freight (RF); Rural Passenger (RP); International Freight (ILF); and International Passenger (ILP); All Markets Freight (All–F); All Markets Passenger (All–P); and All Markets both Passengers and Freight (All).

TABLE 104 Finance, Pricing and Taxation Policies—Continued

STATUS QUO POLICIES	*NTPSC POLICIES*
Overall	
	the needed congressional review, legislative veto procedures could be established that would call for Congress to have a limited time in which to disapprove the stated objectives, before the objectives automatically become effective. (All)
Expenditures	
1. Federal aids include highway, waterway, rail and airport programs directed to other levels of government. Loans, guarantees and other forms of promotion are also types of aid. (All)	1. Granting of any future Federal aids to the private sector must be conditioned on benefits (including non-financial) in excess of costs, evaluated using proper procedures. When determining a benefit/cost ratio, a common discount rate established by Congress should be used. (All)
2. Funds are provided to Amtrak to subsidize capital improvements and operating deficits. (IP)	2. Federal subsidies to Amtrak should be reduced. Amtrak management should have complete freedom to determine levels of service, which system segments must be abandoned each year, and which segments might be operated for profit when subsidy is eliminated. (IP)
3. Subsidies are provided to local service air carriers and commuter air carriers to provide essential intercity air passenger and some freight service to small communities. (IP, IF)	3. The air subsidy program (as provided in Pub. L. 95–504) should be phased-out so that a transportation system will develop to serve all areas based upon the consumer's willingness to pay, supplemented with user subsidies if believed necessary by Congress. (IP, IF)
4. Beginning in 1978, subsidies are authorized to state and local public bodies to pay up to 50 percent of the cost of purchase-of-service agreements with private bus companies for service to rural and small urban areas. (IP, RP, UP)	4. Subsidies should be temporary, to encourage the private sector to use marketing to promote ridership and to operate efficiently to reduce costs, so that subsidies can eventually be withdrawn as the service becomes profitable. (IP, RP, UP)
5. Federal financial assistance for transportation varies greatly from program to program (e.g., 100-percent Federal share for pavement-marking projects; 75 percent for most Federal-aid highway projects; 90 percent for the Interstate System; 100-percent subsidy of Amtrak operating deficits; 75 percent for airport construction; 50 percent for airport terminal construction). Highway trust-fund-financed programs are available for construction, reconstruction, safety and planning. Funds go to the states, or through the states to local units of government, using allocation formulas based, for example, on population, as in the case of urban systems. Mass transit funds from general revenues go to states and to local authorities (e.g., UMTA Sec. 5), based on formulas often using population as one factor, or at the discretion of the Federal agency. (All)	5. More flexibility and transferability among categories should be permitted. For Federal categorical aids, standardized investment analysis for all projects should be used so that funds flow to areas and purposes of greatest need. (All)
6. Federal funds are not generally available for simple maintenance, only for major improvements (e.g., resurfacing, restoration and reconstruction of Federal-aid highways). (All domestic)	6. No change. (All domestic)
7. Airport and Airways Development Aid Program funds are allocated by a formula based on enplanements (i.e., $6.00 for each of the first 50,000 enplaned, $4.00 for each of the next 50,000 enplaned, up to $0.50 for each enplanement over 500,000). Remaining funds go partially to commuter airports and for other uses at the discretion of FAA. (IF, IP, RF, RP, ILF, ILP)	7. No change. (IF, IP, RF, RP, ILF, ILP)
8. States may use highway funds for bikeways and pedestrian walkways. The Surface Transportation Assistance Act of 1978 authorized $20 million a year for bikeway projects. OMB has not, however, requested an appropriation for this new program. (UP, RP)	8. States should be actively encouraged to include bikeways and pedestrian walkways in the design of highway facilities receiving Federal assistance, in the interest of energy conservation, safety, and development of a balanced multimodal transportation system. (UP, RP)
9. Operating Differential Subsidies are available to U.S.-flag ocean carriers. Ships must operate on accepted trade routes and must be owned and operated by U.S. citizens. The amount of cost increase allowed is tied to an index of wages in other sectors of the economy. During 1977 the ODS amounted to $344 million. (ILF, ILP)	9. Operating subsidy should be retained, but performance and the needs of national defense should be stressed. (ILF, ILP)

TABLE 104 Finance, Pricing and Taxation Policies—Continued

STATUS QUO POLICIES	*NTPSC POLICIES*
Expenditures	
10. Federal loan guarantees are now available to airlines, including commuter carriers. Title XI Mortgage Guarantees (Federal Ship Financing Guarantees) are available to U.S.-flag operators to obtain private capital to construct or reconstruct ships in U.S. shipyards. MarAd is empowered to guarantee up to $6.95 billion. (IF, IP, RF, RP, ILF, ILP)	10. Some reduction in loan guarantees (as well as in other forms of aid) should be sought via multilateral negotiations. However, guarantees for items considered important for national defense should be retained, given the success of the program in accomplishing risk-sharing. (IF, IP, RF, RP, ILF, ILP)
11. Construction Differential Subsidies are available to U.S. citizens for U.S.-flag ships to be used in foreign trade. This subsidy equalizes the cost to the buyer of purchasing a ship from U.S. yards with that built in a foreign yard. However, the subsidy is limited to 50 percent of the costs of the ship. (ILF, ILP)	11. Eligibility requirements for the Construction Differential Subsidy should be made more explicit so that vessels will contribute to national defense and security. (ILF, ILP)
Trust Funds	
1. Modal trust funds exist for highways, airports and inland waterways. (All)	1. Retain modal trust funds. (All)
2. Federal transportation assistance is largely categorical. Highway and airport funds are provided from trust funds, while public transit is aided via general revenues. Some transferability is permitted. Some direct general-purpose Federal revenue sharing is available to cities and states. (All)	2. Retain flexibility. The establishment of an urban transit trust fund should be studied. (All)
User Fees and Taxation	
1. Current user-charge mechanisms and levels do not stress efficiency, as they do not vary directly with use of particular segments. For highways, the fuel tax is the major revenue-generating mechanism. Congress authorized another study, begun in 1978, to determine the extent to which various users now cover highway costs. Tolls are generally forbidden on federally-funded highways. Recently enacted legislation authorizes imposition of a fuel tax on inland waterways to reach a level of 10¢ per gallon by 1985. If waterway investment remained at current levels, not all waterway navigation costs would be recovered by this user charge. (All)	1. In addition to fuel taxes and other user fees, allow tolls in certain special cases (for new or upgraded federally-aided facilities) as a means of properly allocating demand and investment. (All)
2. Some transportation rights-of-way are subject to state and local property taxes in some states, while publicly provided rights-of-way are not. (All)	2. Equalize the effects of taxation among modes by encouraging states to eliminate discriminatory property taxation of rights-of-way. (All)
3. Federal transportation programs are funded with both general funds and user fees. (All)	3. Federal assistance to transportation should be financed largely by users who pay the costs for the benefits they receive. Care must be exercised in determining actual Federal costs which are attributable solely to the commercial transportation objective (i.e., costs related to recreational and safety aspects of transportation projects should be attributed to those users and beneficiaries). (All)
4. Port user charges are not required by the Federal government, despite Corps of Engineers' services and DOC/EDA grants available for use at ports. (IF, IP, RF, RP, ILF, ILP)	4. Benefits compared to costs of applying direct user fees should be studied. (IF, IP, RF, RP, ILF, ILP)

government support for technology R&D to provide competitive, energy-saving innovations in transportation. The declining trend for R&D support, both private and public, could have serious economic, trade and foreign competition consequences, especially in light of the fact that foreign competitors may receive large and increasing amounts of government support. In particular, increased Federal funding is needed in areas where the risk is too great or uncertain, or development costs are too high for private industry to implement improvements needed to save energy or provide better service. Examples include a new commuter aircraft and adaptation of an airway system to accommodate these aircraft; energy-efficient automobiles, trucks and buses; and alternative fuel development. These improvements can be accomplished through more R&D support for new equipment such as gas turbine engines, loan guarantee programs to reduce manufacturers' risk or encourage development, and policies designed to eliminate unfair foreign competition in U.S. transportation markets.

Table 105 gives more detail about status quo planning and information policies compared to those recommended by the NTPSC.

GOVERNMENT ORGANIZATION

Status Quo

NTPSC staff found 64 Federal agencies (from the congressional, executive, independent regulatory and quasi-governmental sectors) administering over 1,000 policies and programs which involve transportation. In addition, 30 congressional committees have legislative and oversight responsibilities directly affecting transportation. Many agencies are seeking to coordinate their transportation activities internally (e.g., USDA and HEW), and others are working together with other agencies to avoid conflicts (e.g., ICC and the FMC). Nonetheless, not only is there no unified national transportation policy, but there is a wasteful and duplicative institutional structure at the Federal level. These institutional problems are also evident at other levels of government. For example, Federal Title V regional commissions, regional councils, and regional offices of DOT modal administrations exist. Some have very little responsibility. Federal regulations also mandate Metropolitan Planning Organizations, and these may not be representative of local interests, as no requirements exist that members of MPOs be elected or democratically represent the geographic situation of the metropolitan area.

NTPSC Policies

The Federal transportation structure must be streamlined for managerial efficiency and to eliminate the costly burdens that redundant Federal agencies and rules impose on the private sector and on state and local governments. To facilitate a coordinated approach to national transportation policy, some grouping of widely scattered transport functions is required.

DOT should become the lead agency in all Federal actions primarily directed toward transportation objectives. For the future, interrelationships between transportation, telecommunication and energy should be studied by the reconstituted DOT in cooperation with other agencies with the goal of encouraging coordinated policies, especially for applications in which substitutability is possible. Impediments to coordination at the Federal level should be eliminated.

Transportation activities of non-transportation agencies should not all be transferred to DOT. However, DOT review of economic analyses justifying such transportation expenditures is called for, with special emphasis on non-capital-intensive coordination, rather than new spending for duplicative equipment and services that compete with private providers. The Federal government should review its regulations and categorical funding programs now directed at non-transportation sectors, using the same policy themes as those expressed by NTPSC for the transportation sector. This should be done so that transportation markets are not adversely affected by these non-transportation programs.

As stated above, a residual U.S. transportation commission would replace existing separate Federal regulatory commissions.

The congressional committee structure should be revised by each branch of Congress. That is, each branch of Congress might choose to have a committee treating overall national transportation legislation, with appropriate subcommittees which might be structured along modal lines. There may be some areas which do not quite fit into exclusive transportation jurisdiction. One example is urban mass transportation, which in the Senate is presently within the jurisdiction of the Banking, Housing and Urban Affairs Committee, and in the House is within the Public Works and Transportation Committee. In recent committee reorganizations both houses dealt exhaustively with the proper jurisdiction for mass transportation. Each body came to separate solutions. The Senate felt strongly that mass transportation was inextricably tied to urban affairs and voted to continue such jurisdiction, while the House opted to change its jurisdiction to the Public Works and Transportation Committee. Given the hybrid nature of transit in serving both transportation and non-transportation goals, the position of each chamber in its internal organization is fully supportable and should be respected.

Table 106 shows Federal status quo government organization policies compared to the NTPSC policy recommendations.

CONCLUSION

The recommendations in this chapter are designed to improve what is already a reasonably effective U.S. transportation system, and to equip that system to meet the challenges with which it must cope through the year 2000. These policies require the Federal government to work with the private sector and state and local governments to meet these challenges. Compared to status quo policies, the NTPSC recommendations would encourage Federal actions that are more consistent, more flexible, and more cost-effective.

The impacts of these NTPSC policies are discussed in the next chapter, followed by a chapter which gives the details of implementing the policies.

TABLE 105. Planning and Information Policies[a]

STATUS QUO POLICIES	NTPSC POLICIES
Planning	
1. No effective Federal requirements exist for multimodal planning. (All)	1. State and local multimodal planning should be encouraged. In addition, Federal and federally sponsored single-mode planning should be coordinated. (All)
2. For Federal plans and projects, adherance to strict regulations and standards is frequently required in planning and design, regardless of whether it is in fact cost-beneficial. (All)	2. Planners and designers should take into account local conditions in specifying alternatives (uniformity should not be assumed always to be the efficient approach). Planning should consider the effects that aid to one mode will have on competing modes. (All)
3. FAA develops a National Airport System Plan—a compilation of development needs of U.S. airports. Amtrak maintains a five-year plan, updated annually. (IF, IP, ILF, ILP)	3. While national systems planning should continue, planning related to capital improvements in local areas, particularly land-use planning, is a local responsibility. (All)
4. Many other Federal agencies have been involved in planning transportation. The FHWA, FRA, Army Corps of Engineers, ARC, USDA and others have been involved in planning waterways, scenic and forest roads and more recently rail service in rural areas. HEW, FHWA and UMTA have provided funds to plan specialized and public-transit systems. (All)	4. Federal objectives for passenger and freight transportation should be made known to states and relevant substate transportation agencies to be incorporated in their plans. Also, the U.S. DOT should provide guidelines and information (rather than line-by-line requirements) for states to: (a) Develop multimodal, statewide (and regional) transportation plans; (b) Obtain input and coordination between private providers, users, social agencies, and others; (c) Perform economic analysis; (d) Consider non-transportation problems (e.g., telecommunications); (e) Submit the plan to DOT for review prior to funding; and (f) Update the plan periodically. (All)
5. MPOs rely heavily on Federal assistance for planning, data preparation and A–95 review activities. Federal assistance for planning includes a dedicated share of Highway Trust Fund expenditures and UMTA grants for special studies. (All)	5. To encourage more effective planning, all dedicated planning assistance from the Federal government should be eliminated, and any portion of capital or operating assistance, and other categorical or block grants, should be available for planning at state and local discretion. (All)
6. Excess shipping capacity exists in the world. The U.S. maintains an open conference stance and has not taken part in efforts to control capacity through planning. (ILF, ILP)	6. The U.S. should use the OECD or another international mechanism to discuss how to deal with surpluses of ship capacity (perhaps involving scrapping or mothballing). In addition, a continuing world productivity conference to bring rationality to the world market may be acceptable to most nations. The conference might publish rates and information about lines in a manner similar to IATA or ICAO for the air mode. (ILF, ILP)
Information	
1. Each Federal transportation and nontransportation agency and program usually establishes reporting requirements. Rarely are the programs based on objectives, and thus it is difficult to assess cost-effectiveness. (All)	1. Any reporting requirements established by a Federal agency must be kept to a minimum, be directly related to a Federal objective, and be reviewed periodically. Every Federal program should have one or more quantified objectives so that it is possible to determine what information should be collected, at which intervals, to facilitate evaluation and sunset review. (All)
2. The lack of a coordinated Federal data-gathering policy sometimes threatens the availability of needed information when an agency or a program is eliminated (e.g., CAB). (All)	2. The concept of a national transportation data center should be explored, without preempting private state and local efforts, and without generating unneeded information. (All)

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[a] Each policy is followed by a symbol that indicates its relevance to transportation in these markets: Intercity Freight (IF); Intercity Passenger (IP); Urban Freight (UF); Urban Passenger (UP); Rural Freight (RF); Rural Passenger (RP); International Freight (ILF); International Passenger (ILP); All Markets Freight (All–F); All Markets Passenger (All–P); and All Markets both Passengers and Freight (All).

TABLE 105. Planning and Information Policies —Continued

Research

STATUS QUO POLICIES	*NTPSC POLICIES*
1. Many categorical programs require planning and support research, with little Federal attempt at integration. Federal R&D is directed toward the air mode through NASA and FAA research. FRA maintains a rail test facility which can be utilized by the private sector. R&D for autos and buses is performed and financed by EPA, NHTSA and others, with primary emphasis on environment, safety and energy conservation. DOT operates a Transportation Systems Center. (All)	1. More Federal dollars should be available to support research of national importance for which benefits are expected to exceed costs. Where gaps in private R&D efforts occur, low-interest loans and grants for research and development and technical information should be available in order to encourage improvement in marginally profitable sectors and to encourage high-risk technological innovation which might not otherwise occur. The Federal government should provide R&D in areas that promise major technological advances. The critical energy issues, in light of all forecasts contained in this report, must be the primary consideration in Federal research involvement. Federal R&D funds for transportation should be distributed equitably between modes. The private sector should be actively involved in such research (perhaps including sharing R&D costs) so that efforts are aimed toward practical innovations which show clear potential for assimilation into the transportation system. Federal agencies should be more sensitive to the marketability of research that they fund. Specifically, the Federal government should continue to encourage the private development of new transportation products through selective policies, and increase Federal R&D support for domestic entities for the following: (a) New or improved engines for aircraft, automobiles, buses, trucks and railroads; (b) New commuter aircraft systems; (c) A study of SST development; (d) New uses of telecommunications in transportation (e.g., satellite navigation); and (e) Alternative fuels. (All)

TABLE 106. Government Organization[a]

STATUS QUO POLICIES	*NTPSC POLICIES*
1. At least 64 separate Federal agencies administer over 1,000 transportation policies and programs. (All)	1. In general the Federal government should be organized to facilitate integration of policies for Federal regulations, funding, services and planning. (All)
2. Three separate independent transportation regulatory commissions exist (CAB, FMC, ICC). The CAB is to expire after 1984 with its remaining functions to be allocated to existing agencies as directed by the Airline Deregulation Act of 1978 (Pub. L. 95–504). (All)	2. A single residual Federal regulatory commission should be created. (All)
3. At least 30 congressional committees share jurisdiction over transportation. (All)	3. Each House of Congress should review its internal committee structure to determine whether a single transportation authorizing committee would be the most appropriate and efficient means of developing and implementing a balanced Federal transportation policy, except in some areas which do not fit into exclusive transportation jurisdiction (e.g., mass transportation in the view of the Senate). (All)
4. The problems of coordinating federally-funded passenger and freight transportation are well known. Coordination has been encouraged, not required. Recently there has been increased effort to improve coordination of transportation systems and resources, many of these involving the rural market. These efforts include: (a) The HEW Office of Human Development coordination demonstrations; (b) A DOT rural working group with HEW representation; (c) A transportation working group within HEW; (d) The White House Rural Task Force on Transportation Coordination; (e) Nine assistant secretaries led by USDA and charged with coordinating rural development programs; and a new Rural Transportation Task Force and USDA transportation office; (f) A working agreement between the ICC and FMC; and (g) An interagency committee on intermodal cargo. (All)	4. Coordination efforts should continue. Having fewer Federal programs and agencies is likely to ease conflicts. The Federal government should concentrate on removing impediments to coordination. (All)
5. The State Department is the lead agency in international transportation negotiations. (ILF, ILP)	5. The State Department should continue to head negotiating teams in order to insure that foreign policy ramifications are fully considered, although improved coordination with other agencies is recommended. (ILF, ILP)

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[a] Each policy is followed by a symbol that indicates its relevance to transportation in these markets: Intercity Freight (IF); Intercity Passenger (IP); Urban Freight (UF); Urban Passenger (UP); Rural Freight (RF); Rural Passenger (RP); International Freight (ILF); International Passenger (ILP); All Markets Freight (All–F); All Markets Passenger (All–P); and All Markets both Passengers and Freight (All).

Impacts of the Policy Recommendations

14

INTRODUCTION

The projected impacts of policies proposed by the NTPSC in Chapter 13 are described in this chapter. As presented in earlier chapters, the NTPSC studied the existing U.S. transportation system, and ascertained the more important issues that confront policymakers today, and the issues that are anticipated to emerge through the year 2000. In its investigations, the NTPSC used a system of forecasting models that, together with scenario development and technological surveys, provided baseline transportation projections. These projections assume that status quo policies will be retained, and forecast the consequences through time. The NTPSC's recommended policies were developed in cognizance of the forecasts and are designed to resolve the emerging transportation issues. Thus, the important transportation variables modeled by the NTPSC in its baseline forecasts are expected to be "improved" in net terms by implementing new policies.

The NTPSC proposed its recommended policies on the basis of individual understandings of the consequences. This knowledge was derived from several sources. First, the Commissioners' experiences as transportation professionals or as elected officials were considered in the policy deliberations. For example, many of the NTPSC's transportation issues have been debated in corporate boardrooms or in trade association sessions. Congressional hearings and legislative debate on transportation policy also provided important experiences to influence the thinking of the Commissioners. In addition, information gathered from the NTPSC public hearings was considered. Research of the NTPSC staff was evaluated, both that presented in support of the overall NTPSC workplan, and that provided in response to specific questions of one or more Commissioners. Finally, in debate over the NTPSC policy proposals, the Commissioners shared and jointly evaluated their individual experiences.

Having considered the possible consequences of various policy proposals, and having drafted an initial set of preferred policy recommendations, the NTPSC Commissioners and staff continued to evaluate the impacts of these policies. In some cases, the initial proposals were refined based on new evidence.

Although it is impossible to reproduce in one chapter the complete body of evidence developed by the Commissioners and staff, some of the highlights are given. This chapter addresses such questions as:

1. Why are these policies recommended by the NTPSC rather than others?
2. What research methods were employed to evaluate potential impacts?
3. What evidence was considered in predicting the impacts of the policies?
4. How are improvements to be measured?
5. If these policies are implemented, what is the dollar value attached to the predicted net gains?
6. How will things be better for the users and providers of transportation in the U.S.?
7. Exactly who will gain, and who will lose, from these new policies?

MEASURING AND FORECASTING IMPACTS OF POLICY ALTERNATIVES

Analysis of Individual Policies and Groups of Policies

Guided by a search of methods used in previous studies and of research methods employed at agencies, firms, and universities, the NTPSC has reported impacts of its policy alternatives using an eleven-goal format. The eleven goals are shown in Table 107. Reporting the consequences of proposed policy using a standard eleven-goal format appears to be unique among the policy studies reviewed by the NTPSC.[1]

To test its impact analysis, the NTPSC began (in July 1977) a number of investigations of existing policies and programs designed to provide evidence about suspected gaps and conflicts. Beginning in June 1978, participants in the NTPSC policy development process (described in Appendix V) also provided information on impacts for status quo and other policy alternatives. Finally, beginning in Janu-

TABLE 107. Aspects of national transportation goals

Goal	Aspects
1. Adequate Service	Adequate, comfortable, convenient, fast, accessible to all, reliable.
2. Appropriate Rates/Prices	Reasonable fares, rates, and costs for rider, shipper, and providers of transportation.
3. Economic Efficiency	Maximize service for each transportation dollar (inputs), increase administrative effectiveness and intergovernmental cooperation, promote competition among modes.
4. Energy Conservation & Development	Conservation and development of transportation fuel, and movement of energy for other uses.
5. Environmental Protection & Enhancement	Aesthetics, noise, air, water protection, historical site preservation.
6. Safety	Operators, passengers, and pedestrians safe from personal injury and crime, goods are safe from damage, appropriate vehicle design and insurance.
7. Employment	Transportation employment opportunities, job protection, access to all employment opportunities, fair labor-management relations.
8. Industry Promotion & Protection	Protection for each mode against unfair competition, maximize private provider participation.
9. Regional & Urban Development	Economic development, coordinated land use and transportation development.
10. Equity	Impartial treatment of modes, users, and regions.
11. Defense	National and civil defense, international relations.

ary and continuing through May 1979, NTPSC staff teams were organized to investigate the impacts of the draft NTPSC policy recommendations.

In the 1977 test process, the 1978 policy development process and the 1979 impact analysis process, impacts were reported for all eleven goals, regardless of the stated goal of a policy or program. For example, every new policy recommended by the NTPSC was examined for its impacts on transport safety, even if the expressed goal of the policy being examined was not safety. In some cases, no impact was discernible; often, no impact was expected. Sometimes, however, the results were unexpected.

Within each goal area, different impact indicators were used, depending on the judgment of the researchers and the availability of published evidence. For example, it is well known that the use of average energy efficiency alone is a poor method to compare the energy-saving potential of various policies. Instead, these averages should be used as a base from which adjustments are made such as for terrain, load factor, engine and other vehicle characteristics, and circuity.[2]

Researchers were encouraged to make such necessary adjustments and to specify the assumptions and techniques they used to generate impact results. Where quantitative results could not be obtained, qualitative judgment was used, but again researchers were asked to state explicitly their assumptions and analytic techniques. Some of the NTPSC impact analysis was as instructive for its required assumptions as for its conclusions.[3] Thus, the degree of certainty possible regarding the impacts of the NTPSC's recommendations varies from policy to policy, even though a common goal structure was used throughout.

Analysis of Policies Using Models

The NTPSC recognized its statutory mandate to consider systemwide impacts through the year 2000 and to explore national and regional consequences. It used/created a system of models that provided a means for determining impacts. These models and the baseline forecasting results have been described in detail in Chapter 5. The models aided in forecasting the impacts of continuing most current U.S. transportation policies, combined with new (deregulated) energy policies. This information is valuable to the NTPSC impact analysis process, in comparing proposed policies to the impacts of continuing present policies.

STRUCTURE FOR REPORTING THE IMPACT ANALYSIS RESULTS

Throughout the NTPSC report, several techniques have been used to structure the presentation. First, the analysis has dealt with markets, rather than modes, and distinguished between passenger and freight transportation. Second, five instruments of policy were used to order the discussion: regulation; ownership and operations; finance, pricing and taxation; planning and information; and governmental organization. Third, transportation was considered through the year 2000. Finally, eleven goals were used as a common framework for impact analysis.

To use all of these elements combined would require a very rigid format. Instead, the following sections reporting the results of the NTPSC impact analysis are organized primarily by the five policy instruments. Within each section, the NTPSC policy recommendations are summarized; then, only where there is important information available on markets, modes, passengers versus freight, changes through time, or any of the eleven goals, are these results given.

REGULATION

ECONOMIC REGULATION

NTPSC Policy Recommendations

The NTPSC economic regulation policies are broadly addressed to reducing and equalizing regulations among the modes and providing an improved competitive environment. Firms would compete within and between modes subject to equal fitness requirements administered by an impartial residual transportation commission and subject also to stringent safety rules and enforcement and to reformed antitrust rules and enforcement applying to other sectors of the economy. Specific recommendations, pertaining to particular transport modes or markets, are indicated throughout this section.

Overall Effects

The greatest impacts of the NTPSC policy recommendations for changed economic regulation will be experienced by rail and motor carriers of freight and their users, and by intercity bus companies and their passengers. This is true because water carriers are now primarily unregulated, and air cargo carriers totally so, while air passenger service is being gradually deregulated. The expected impacts are discussed next, first giving overall estimates of the net benefits of reduced regulation, and next presenting evidence for rail, truck, and intercity bus modes.

Numerous studies reviewed by the NTPSC have estimated the costs and benefits of current economic regulation of transportation. Several of these studies are listed in Table 108. The general expectation is that deregulation of competitive transportation markets as proposed by the NTPSC would yield large net benefits.[4]

It is difficult to compare studies conducted at different times using varying data and methods. Compared to earlier studies that concentrated on efficiency gains from deregulation, more recent research suggests that principal gains may be in the form of better service, with the freedom to offer various price-service combinations to the shipper or passenger. This trend is likely due to two factors; first, the proportion of the freight market that is regulated may be declining, so that eliminating remaining regulation would have reduced efficiency impacts. Second, recent studies may employ more sophisticated techniques and, by concentrating on commodity-specific data, may obtain more precise results.

Although sound evidence exists that the benefits of a program of deregulation are substantial, all benefits cannot be predicted accurately. There are reasons, however, why disagreement over details of the costs of particular regulatory practices should not be permitted to cloud the overall picture. In particular, the exact consequences of altering the role of motor carrier rate bureaus as forums for fixing prices may not yet have been fully determined. Rate bureaus have been reluctant to divulge needed information for determining if price-setting activities keep motor carrier rates above competitive levels, and to what extent, or whether there may be compensating benefits to shippers. To date, only partial answers have been available, such as those of researchers examining intrastate motor carrier rates in the unregulated environment of New Jersey. In that state, it was shown that unregulated rates are higher than expected by the researchers, perhaps due to the effect of regulated, rate-bureau-determined rates.[5]

Additional evidence was provided to the ICC in its Ex Parte 297, Sub. No. 3, investigation of rate bureau practices by such agencies as the Department of Justice and the Federal Trade Commission's Bureau of Competition. The ICC is empowered to alter approved rate bureau practices where necessary. The DOJ and FTC, among others, argue that the ICC should act to remove the rate bureaus' antitrust immunity.[6]

The results of an ongoing analysis sponsored by the Senate Judiciary Committee using data tapes from continuing traffic studies[7] should be available during 1979 and should shed further light on the substantial costs to the shipper of motor-carrier rate bureau practices. This study uses data collected by rate bureaus themselves.

Although the evidence does not totally agree as to the level of benefits from rate bureau reforms (such as those proposed by the NTPSC), the net effects have, nonetheless, been shown to be positive. The burden of proof should be on those who argue for retaining current regulations. The purported benefits of the existing regulated situation are certainly easier to quantify, if they exist, than the potential benefits of proposed deregulation. Moreover, there are measurable administrative costs to the regulatory process. On the other hand, the benefits of price setting to the shipper under status quo policies have not been demonstrated by those advocating continued regulation. For this reason alone, the NTPSC would favor reform of the policies.

The following are capsule descriptions of impacts of reduced economic regulation of transportation.[8]

EFFICIENCY

It is presumed that competition in most transport markets is sufficient to insure rates at or below cost plus a reasonable profit, thus providing protection for the shipper. Efficiency among modes cannot be secured, however, unless the NTPSC approach to

TABLE 108. Summary of estimates of costs of regulation[a]

Misallocation of traffic due to rate distortions:

1. Harbeson (1963): $3 billion/yr. (manufacturing)
2. Peck (1965): $0.203 to 0.407 billion
3. Friedlaender (1969): $0.3 to 0.4 billion/yr.
4. Domencich & Woods (1971): $8 billion
5. Hilton (1973): near zero
6. Sparling (1974): $0.689 to 4.213 billion
7. Boyer (1975): $0.125 billion (for manufacturing)
8. Meyer (1975): $2 billion
9. Moore (1975): $0.2 to 2.9 billion
10. Levin & Peck (1976): near zero
11. Keeler (1976): $0.5 billion (upper bound figure)
12. Altonji (1976): near zero

Loss from excess capacity:

In railroads:

1. Friedlaender (1971): $2 billion/yr.
2. Borts (1960) & Griliches (1972): "quite low"
3. Moore (1975): $2 to 2.4 billion/yr.
4. Keeler (1976): $3.5 billion/yr.

In trucks:

Moore (1975)

1. Common Carrier Trucks: $1.4 to 1.89 billion
2. Private Trucks: $0.1 to 1.0 billion

Overall Losses:

1. Nader and Green (1973): $4.0 to 8.7 billion for ICC
   Nader and Green (1973): 2.0 to 4.08 billion for CAB
   Nader and Green (1973): 2.0 to 3.5 billion for FMC
2. OMB (1975): $4.0 to 9.0 billion in surface
   OMB (1975): $2.0 to 4.0 billion in air
3. ICC (1976): $1.7 billion loss through $4.8 billion *gain*
4. GAO (1977): $1.4 to 1.8 billion in air
5. Allen and Hymson (1977) $1.4 to 2.9 billion in trucking

SOURCE: The following references are used in Table 108:

Misallocation of traffic due to rate distortions:

1. Robert W. Harbeson, "Toward Better Resource Allocation in Transport," *Journal of Law and Economics* XII (October 1969), cited in Theodore E. Keeler, *On the Economic Impact of Railroad Freight,* Working Paper No. SL-7601, paper presented to the Econometric Society Meetings, September 1976, Berkeley, Calif.: University of California, Department of Economics, 7 September 1976, p.1.

2. Merton J. Peck, "Competitive Policy for Transportation?" in A. Phillips, ed., *Perspectives in Antitrust Policy,* Princeton: Princeton University Press, 1965, pp. 244–72, cited in T. G. Moore, "Deregulation of Surface Freight Transportation," in A. Phillips, ed., *Promoting Competition in Regulated Markets,* Washington, D.C.: The Brookings Institution, 1975, pp.55–98.

3. Ann F. Friedlaender, *The Dilemma of Freight Transport Regulation,* Washington, D. C.: The Brookings Institution, 1969, cited in Keeler, p.1.

4. Thomas A. Domencich and Douglas W. Woods, "Competition in Intercity Freight Transportation," in *Proceedings of the Twelfth Annual Meeting of the Transportation Research Forum,* held October 18–20, 1971, Philadelphia, Oxford, Indiana: Richard B. Cross Co., 1971, pp. 258, 274, cited in Joseph G. Altonji, "Estimating Misallocation of Traffic Between Rail and Truck Transport," in *Proceedings of the Seventeenth Annual Meeting of the Transportation Research Forum,* held October 28–30, 1976, Boston, Oxford, Indiana: Richard B. Cross Co., 1976, p. 378.

5. George W. Hilton, "The Costs to the Economy of the Interstate Commerce Commission," in the U.S. Congress, Joint Economic Committee, Subcommittee on Priorities and Economy in Government, *The Economics of Federal Subsidy Programs: Part 6—Transportation Studies,* Washington, D.C.: Government Printing Office, 1973, cited in Keeler, p.1.

6. Lee I. Sparling, "Rate Regulation and Freight Traffic Allocation – A Review and Revision," *Social Science Working Paper Number 68,* California Institute of Technology, 1974, pp. 19–24, cited in Altonji, p.378.

7. Kenneth D. Boyer, "Minimum Rate Regulation, Modal Split Sensitivities and the Railroad Problem," *Journal of Political Economy* 85 (June 1977), pp. 493–511, cited in Keeler (1976), p.1.

8. Meyer, cited in Moore.

9. Moore, pp. 55–98, cited in George W. Hilton, "What Does the ICC Cost You and Me," *Trains,* June 1978.

10. Richard C. Levin and Merton J. Peck, "Allocation in Surface Freight Transportation: Does Rate Regulation Really Matter?," Yale University Department of Economics Discussion Paper No. 31, August 1976, cited in Keeler (1976), p.1. See also, R. C. Levin, "Allocation in Surface Freight Transportation: Does Rate Regulation Matter?" *Bell Journal of Economics,* Spring 1978, pp. 18–45.

11. Keeler (1976), p.35.

12. Altonji, p.387.

Loss from excess capacity:

1. Ann F. Friedlaender, "The Social Costs of Regulating the Railroads," *American Economic Review* 61 (May, 1971), pp. 226–234.

2. Zvi Griliches, "Cost Allocation in Railroad Regulation," *The Bell Journal of Economics* 3 (Spring 1972), pp. 26–41; and George G. Borts, "The Estimation of Rail Cost Functions," *Econometrica* 28 (January, 1960), pp. 108–131, cited in Keeler, pp. 1–2.

3. Moore, cited in Hilton.

4. Keeler, cited in Hilton.

Overall Losses:

1. Ralph Nader and Mark Green, "Economic Regulation vs. Competition: Uncle Sam the Monopoly Man," *Yale Law Journal,* April 1973, p.882, cited in *Study on Federal Regulation,* p.66.

2. See U.S. General Accounting Office (GAO), "An Economic Evaluation of the OMB Paper on 'The Cost of Regulation and Restrictive Practice'" published as a staff paper by the Subcommittee on Oversight and Investigations, House Committee on Interstate and Foreign Commerce, September 1975; Appendix III is the OMB paper. Cited in *Study on Federal Regulation,* p.63.

3. Interstate Commerce Commission (ICC), Bureau of Economics, *A Cost and Benefit Evaluation of Surface Transport Regulation,* (Statement No. 76–1), undated (1976), cited in *Study on Federal Regulation,* p.72.

4. General Accounting Office (GAO), *Lower Airline Costs Per Passenger Are Possible in the United States and Could Result in Lower Fares,* Report no. CED–77–34, Washington, D.C.: 1977, cited in *Study on Federal Regulation,* p.33.

5. W. Bruce Allen and Edward B. Hymson, "The Costs and Benefits of Surface Transportation; Another View," in Paul W. MacAvoy and John W. Snow, *Regulation of Entry and Pricing in Truck Transportation,* Washington, D.C.: American Enterprise Institute, 1977, cited in U.S. Congress, Senate, Committee on Governmental Affairs, *Study on Federal Regulation: Vol. VI – Framework for Regulation,* 95th Cong., 2d Sess., Washington, D.C.: Government Printing Office, 1978, p.33.

[a] Estimates are nominal dollars for various years.

government financing is also adopted so that market freedom is founded upon neutral public policies. The force of competition is expected to eliminate inefficient carriers or cause them to reform their practices. These benefits will not necessarily flow to communities or routes where traffic volume will support only one or several carriers. Nor is freedom to abandon likely to result in as large a reduction of rail mileage as efficiency criteria require. As major transport inputs are procured in markets characterized by a measure of market power, the most efficient allocation of resources between transport and other sectors of the economy cannot be insured without appropriate antitrust-type enforcement.

Results become speculative because regulation which the Congress removes can be reimposed; hence, the responses of large regulated carriers (especially railroads) and of the regulatory agencies are likely to be cautious. It seems that most railroads did not benefit from the pricing freedom which Congress believed it had granted in the 4R Act. Moreover, railroads and other carriers find a portion of their traffic tendered by large shippers who are equipped with strong bargaining power and wide alternatives.

ADEQUATE SERVICE

With regulations adjusted to permit carriers freedom to price within wide limits, various service-rate packages presumably will be offered, affording shippers a wider choice.

APPROPRIATE RATES AND PRICES

The economic structure of transportation markets must be considered in predicting the effects of deregulation on rates and prices. Prices that reflect incremental costs should prevail in markets displaying either constant or increasing costs as the scale of operations increases. Where the economic structure of the markets displays decreasing costs as the scale of operations increases, monopoly may tend to result. In all cases, enforcement of improved antitrust rules and regulations will be required, using the mechanisms that now apply to other sectors of the economy.

ENERGY CONSERVATION

Deregulation has been expected, by adjustment of pricing, to induce the shift of traffic to the more efficient modes. The combined impact of constrained capital inflow to the rail industry since 1906 and the massive public investment in the Interstate Highway System since 1956 has altered the cost relationships between these modes such that much more modest expectations are in order, absent a massive upgrading of the rail plant. The premise that railroads are more fuel efficient in their present state than motor carriers for the kinds of hauls performed by motor carriers is at issue.

The premise that freedom from entry and route controls will greatly improve the round-trip loading of motor vehicles, hence their fuel efficiency, may not give adequate account to the imbalance of traffic flows and the degree of use of specialized vehicles dedicated to particular commodities having one-way flows.

ENVIRONMENT

The impact here is as uncertain as in the case of energy conservation. Sharp price competition, however, might induce less adequate maintenance of vehicles with possible adverse energy, environmental and safety effects. For this reason, the NTPSC has recommended strict enforcement of upgraded safety standards for certificated carriers that will require on-site inspection by insurance firms.

SAFETY

The problem exists of enforcing safety regulation with a shifting population of carriers under severe competitive pressure. Enforcement of hours of service, vehicle standards, and other regulations now may be most effective among regulated carriers and large industrial proprietary operations.[9] The NTPSC proposal to retain a Federal certificate system addresses the problems of safety and insurance, as well as of financial fitness. It conditions the right of motor carriers to operate (as distinguished from the present requirement to obtain operating authority) upon demonstration of adequate insurance (or proof of financial responsibility equal to that required by insurance regulations)—covering public liability, property damage, cargo (for other than private carriers) and environmental restoration—and demonstration of payment of the Federal heavy-vehicle highway-use tax.

EMPLOYMENT

Given the expected lack of major intermodal shifts, the impact of regulatory reform on employment is likely to be minimal in the operating forces. With certain activities of rate bureaus curtailed, and ratemaking decentralized to meet competition on the spot, carriers may require more staff for marketing, ratemaking, agency, and customer-contact purposes. The changed character of ratemaking may require different employee skills. (The Class B ICC practitioner will lose business, for example, but lawyers may find profit in increased litigation before the courts.) Shippers may find it necessary to enlarge traffic departments due to changing service patterns and rates, although it is also possible that rates would become simplified without today's detailed regulatory apparatus.

INDUSTRY PROMOTION

The advantage, in the short run, is likely to go to flexible organizations which can readily adjust to change. In the longer run, less-than-truckload business and railroading should see concentration of volume in the hands of fewer carriers having broader territories (reflecting possible economies of scale), increased bargaining powers, and improved capital flow.

URBAN AND REGIONAL DEVELOPMENT

Rural and sparsely-populated areas may gain from better service (perhaps at higher rates more reflective of costs) and high-density intercity markets may also gain from continued good service at reduced rates closer to costs.

EQUITY

If equity means equal access to service and to comparable rates by all shippers regardless of size and location, adverse results are anticipated. If equity means equal opportunity to compete for traffic, some carriers will lose due to failure or inability to adjust to changed circumstances, which is the responsibility of carrier management. However, the NTPSC proposals should improve equity in the sense of impartial treatment of modes, users, and regions.

DEFENSE

Increased price-service options should benefit the Department of Defense, as it does other shippers.

GAINERS

The large shippers stand clearly to gain. They obtain automatically the right to intercorporate hauling, the right to back-haul for hire without regulatory proceedings, and mostly unhampered bargaining power in accord with the traffic volumes at their disposal. That shippers in general will benefit from improved service, availability of capacity in peak periods, and generally lower rates is also likely. Carriers with flexible managements should be able to capitalize on rate and route freedom to enlarge and balance traffic volume even though their margins may be reduced, with the possible exception of certain railroads that are tied to territories and route patterns by fixed infrastructures.

LOSERS

As the cross-subsidy inherent in present rate structures disappears, high-cost shipments will bear higher rates. Much opposition to branchline abandonment stems from the ability to retain subsidy to higher-cost traffic through existing regulations. The NTPSC proposals require that losses be supported for any carrier required to continue uneconomic service. Under reformed procedures, small carriers will require improved cargo clearinghouse support, perhaps using enlarged alliances to expand joint territorial contact. Carriers will tend to have more opportunity to utilize the economies of owner-operators than in the past, which might result in a relative loss for organized labor, at least in the short run. The increase of carrier freedom may abridge the present rights of certain shippers who lack bargaining power. For this reason, the NTPSC proposes the application of reformed antitrust rules to prevent predatory behavior by carriers or shippers.

Railroads

RATES

NTPSC Policy Recommendations

The rate policies recommended by the NTPSC which would apply to railroads are: establishment of an expanding no-suspend zone of reasonableness, with rates outside the zone subject to review by a residual regulatory commission on grounds of alleged predation or market power, and rates inside the zone subject to review by agencies enforcing U.S. antitrust statutes; allowance of rail contract ratemaking on terms equivalent to those available to other modes; extension of certain motor and water carrier rate exemptions to railroads; elimination of ICC car service orders and car rental rates; and alteration of rate bureau practices.

Below is listed evidence about impacts of three rail rate policies.

Creation of a no-suspend zone of reasonableness

Economic Efficiency/Rates/Service. Permitting an increasing no-suspend zone enhances economic efficiency by allowing rates to respond to changing market conditions and to tend toward marginal cost in the long run, in markets not characterized by inordinate market power or externalities. (Potential negative efficiency consequences of allowing rate freedom might exist in cases of market power.)

A recent DOT study indicated that rail rates are typically below variable cost on forest products, crushed and broken stone, miscellaneous mixed shipments, fresh vegetables, fruits and nuts, grain mill products, and gravel. According to this study, such rates range from 80 to 100 percent of system variable cost. To the extent that these rates also fall below marginal cost, permitting some upward rate freedom would enhance economic efficiency. The same study predicts that allowing some rate flexibility would result in increased earnings of $250 million to the railroad industry.[10]

The Association of American Railroads has calculated an additional savings to the railroad industry that would result from rate freedom through avoidance of the delay inherent in any rate case before the ICC; the savings would have totaled $2.2 billion between 1967 and 1975.[11] The DOT, in its recent 504/901 study, also cites reduction of regulatory lag as an important savings associated with a no-suspend zone.[12]

Raising rates on those commodities for which rates are currently below variable cost would, according to the DOT, both increase operating revenues for the railroads and result in either some diversion to other modes or a reduction in movement of the affected commodity.[13]

The question of identifying the scope of rail monopoly power is an important aspect of current rail deregulation proposals. The NTPSC has not attempted to address in any depth the market power issue in order to identify areas where some maximum rate regulation should remain in the long run. In a recent congressional symposium that did address this question, it was asserted that given shippers' opportunities for transportation and product substitution, rail captive traffic is constantly changing and eroding. The symposium report cites growth in competition to rail for coal (e.g. mine-mouth generation, other modes, other energy sources), grain, autos and pulp-board as examples of eroding rail market power.[14] On the other hand, the NTPSC research described in Chapter 8 indicates that certain railroads may experience increased market power on certain lines as the volume of coal movement becomes much greater over the next 20 years.

A question which must be posed with regard to any no-suspend zone is whether it is wide enough to permit efficient pricing in general, and at peak and off-peak times in particular. The 4R Act allowed more rate flexibility for demand-sensitive rates, but a requirement for 30-day notice of publication and subsequent court challenges by shippers prevented any truly demand-sensitive pricing. It has been estimated by the DOT that variation in demand for produce movements between California and Chicago for rail service is over 600 percent.[15] Peak-off-peak variations in demand should be considered by Congress in determining the exact level of the no-suspend zone.

Another reasonable prediction as to the likely impacts of rate freedom on rates and service is as follows: Because of current excess capacity in the rail industry, rates in markets with excess capacity would first be driven below average cost and some excess capacity would be eliminated. Where more than one railroad competes in a market, discriminatory rates would cease. Rates would tend to go down on high-valued goods and may rise on low-valued goods. To the extent that railroads maintain any market power, rates would tend to be higher, and more capacity would be shed than under a competitive environment.[16]

Safety. The DOT predicts that there may be some short-run deterioration in rail safety, as rate flexibility will allow the railroads to lower some rates below average cost and begin a process of disinvestment in maintaining track.[17] Once disinvestment is complete, improved economic conditions resulting from regulatory reform should provide more resources for facilities and maintenance, and as a result safety may be improved.

Energy. A recent article illustrated the potential conflict between goals of energy efficiency and economic efficiency, predicting that deregulation of rail and truck freight operations, while enhancing economic efficiency, may have the net effect of increasing energy use.[18] With regard to rail rate freedom in particular, the author cites an example of the shipper who, faced with lower rail rates or improved service, would opt for better service in the form of more frequent smaller shipments. Thus, while the optimum shipment size would decrease, the energy required to fill the shipper's transportation needs would increase.[19] To put this possible effect in context, the author also has found that total logistics cost as well as energy consumption are probably close to being optimized now, and that for-hire transportation is not an area with great potential for fuel savings policies.[20]

Extending Exemptions to the Railroads

Efficiency/Rates/Service. The U.S. DOT, in its comments on the ICC's proposal to exempt fresh fruits and vegetables from rail rate regulation, asserts that the development of monopoly rates (the only potential negative consequence) would not be possible because the commodities in question would be subject to direct motor carrier competition. This lack of potential for rail monopoly pricing would apply not only to fresh fruits and vegetables, but to any commodity now exempt for motor carriers.[21]

With regard to the impact that extending the exemption to railroads would have on rates, the DOT predicts that if the exemption were extended, railroads would offer contract rates to shippers for those who prefer rate stability. Shippers not opting for contract rates would be subject to the prevailing rates reflecting market conditions at the time.[22] In either case, efficiency would be enhanced, and shippers would have access to additional price-service options.

Rail Contract Rates

Efficiency/Rates/Service. According to the DOT 504/901 report, permitting railroads to offer contract rates would reduce shipper uncertainty over future rates, allowing service "tailored more nearly to the needs of particular shippers." Further, DOT predicts that rail contract ratemaking would also help solve the problem of regulatory imbalance, as competing motor carriers and water carriers are currently able to negotiate long-term contracts.[23]

In a recent ICC proceeding on rail contract rates, the DOT predicted that implementation of this policy would lower the railroads' cost of doing business, provide rate-service options more economical to shippers, and would thus be an anti-inflationary policy.[24]

RAIL BRANCHLINE ABANDONMENTS

NTPSC Policy Recommendations

In addition to the several rate-related policies discussed above, the NTPSC recommends policies that would alter the standard for abandonment approval and would expedite abandonment proceedings. The standard would be altered by requiring that carriers not be obliged to offer uneconomic service. In terms of rail branchlines, this would mean that uneconomic branchlines would either be abandoned, or operating losses and a return on investment would become the responsibility of various levels of government or shippers in the affected community, not the carrier. Further, the NTPSC policies specify that abandonment proceedings be expedited, and that a program of limited, temporary subsidy should compensate carriers for losses incurred pending a decision on the abandonment.

Impacts

Economic Efficiency. Easing rail abandonments would enhance direct economic efficiency. Railroads would be able to shed uneconomic branchlines, which would increase prospects for financial viability of the affected rail firms.

The following are estimates of the cost savings to railroads which would result from abandonment of all uneconomic branchlines. There are four categories of cost savings relevant to this issue: revenue accruing from the sale of land and salvageable assets; savings in rehabilitation costs which would occur if uneconomic lines were retained; annual savings in operating losses which would occur if the lines were retained; and savings in legal and administrative costs associated with abandonment proceedings.

The DOT 504/901 study estimates that legal and administrative costs to a carrier for each abandonment application "can exceed $50,000."[25] By expediting the proceedings and altering the standard for approval, the cost per application should decrease, which may encourage railroads to pursue abandonment on nonviable lines.

Another study on the potential benefits of large-scale branchline abandonments calculates cost savings based on an estimate of 35,301 miles of nonviable branchlines. Abandonment of 35,301 miles would imply, according to the simulation, a savings of $1.5 billion from the sale of land and salvageable assets; a savings in foregone rehabilitation costs of $2 billion; and an annual savings in operating costs of between $138 and $303 million.[26] Disinvestment of these lines implies an annual savings to the railroads of between $450 and $600 million. These savings would double the railroads' net return on investment.[27]

A different study predicts that if the rail network is rationalized, additional light-density lines will become nonviable, and that by the year 2000, a total of 75,000 miles of rail network will have been abandoned, assuming no subsidy for continued operations is provided.[28] An abandonment program of this magnitude would imply a much larger cost savings than that estimated above.

The FRA estimated that as of 1971, 21,000 miles of low-density lines were uneconomical, calculating a savings of $105 million in salvage value and an annual savings of between $29 and $42 million in operating costs if the lines were abandoned.[29]

A subsequent DOT study produced higher savings estimates for branchline abandonments. For an estimated 25,500 miles of light-density lines outside the Northeast region projected to be abandoned, the DOT estimated an annual savings in operating costs of $150 million. This savings amounts to 18 percent of the net income of railroads outside the Northeast. The value of the track and facilities of these lines was estimated at $640 million.[30]

In summary, the estimates of abandonment and the cost savings which would result, vary widely. The number of miles affected by a liberal abandonment policy ranges from 21,000, as estimated by FRA in 1971, to 75,000, the estimated nonviable miles to the year 2000, projected by John H. Williams. Estimates of annual operating cost savings range from $29 million to $303 million; salvage value estimates vary from $105 million to $1.5 billion; and savings in rehabilitation costs are estimated (only by Robert Harris) to be $2 billion.

An additional impact on economic efficiency of the NTPSC rail abandonment policy depends on the question of subsidy of lines which are retained. One author raises the issue of cross-subsidy among levels of government: any external benefits from continued service on nonviable lines accrue largely to local areas while the bulk of subsidy for continued service is Federal. Subsidizing uneconomic lines only at the

Federal level, rather than requiring users and direct beneficiaries to share financial responsibility (as is recommended by the NTPSC), thus would have a negative impact on equity.[31]

Rates. The impact of increased rail abandonments on rail rates is uncertain. If increased branchline abandonment results in consolidating traffic on fewer lines, such that economies of utilization are realized, rates may go down.[32] On the other hand, if the rail abandonment policy is accompanied by upward rate flexibility, shippers may be willing to pay higher rates to retain rail service on low-density lines, and fewer abandonments may be necessary. What is relevant is not that rates would increase or decrease, but rather that railroads would no longer be forced to operate lines where rates are below cost.

The question of whether some low-density lines have the potential to become economically viable depends on railroad cost characteristics and the elasticity of demand for transport of the affected commodities. If demand is relatively inelastic, raising rates might generate increased revenues for railroads; conversely, if demand is relatively elastic, raising rates would result in lower revenues. One author who raised the issue observed that it is mostly bulk commodities which originate on branchlines, while processed or finished goods originate on main lines. The service advantage of shipping by truck rather than rail is much less important to shippers of bulk commodities than to shippers of processed and finished goods. Therefore, the demand for rail service by shippers of bulk would tend to be less elastic, i.e., bulk-commodity shippers would be less inclined to shift to motor carriage than shippers who valued the service advantages associated with motor carriage. Therefore there is a possibility that increased rail rates on some low-density lines would generate sufficient revenues to continue service.[33]

For shippers who do shift from rail to truck as a result of rail abandonment, an issue is whether they face higher or lower rates following the shift. It should be noted that motor carriage offers service advantages over rail. Even where truck rates are higher, it does not necessarily imply that shipper's total logistics costs are higher as a result.

Case studies of rail abandonments offer mixed evidence of rate impacts. A study of the impacts of Midwest abandonments following the 4R Act revealed that in the majority of cases the truck rate substituting for abandoned rail service was lower than the rail rate at nearby grain elevators.[34] Only two out of 40 elevators affected by the abandonments closed as a direct result of abandonment. An Association of American Railroads review of a number of retrospective abandonment studies also found that in many instances, shippers forced to switch to motor carrier transportation discovered a resultant reduction in shipping costs.[35] A DOT abandonment study supports this finding. With regard to grain elevators in particular, this DOT study found that as a result of abandonments, large grain subterminals were constructed near high-density rail lines; following abandonment, grain was trucked to these subterminals and shipped in unit trains. The lower freight costs associated with unit trains more than paid the costs of constructing the new subterminals plus trucking to the subterminals.[36]

This evidence does not imply that costs to all shippers will go down as a result of the NTPSC rail abandonment policies. Some shippers clearly will be faced with higher transportation costs which may result in firms going out of business. The evidence does suggest, however, that there is considerable potential for lower costs for perhaps the majority of affected shippers as a result of rail rationalization.

Adequate Service. Where truck rates are so much higher than rail that the shipper cannot afford to use truck service and continue a profitable business, adequate service would be eliminated as a result of the abandonment policies. There is considerable recent evidence, however, as cited above, that instances of lower-cost truck service have resulted from rail abandonment, with resulting expansion of affected businesses.

The DOT has made predictions as to which industries would be most affected by eased rail abandonment. Agriculture was considered the most affected. Lumber and wood products would be moderately affected, and affected to lesser degrees would be food and kindred products, chemical and allied products, and petroleum and petrochemical products.[37] As to specific impacts on the cost of the affected commodities, the DOT estimates that costs to receivers of grain will increase, with the increase being passed along to consumers. The effect on the costs of agricultural limestone may become prohibitive for those who lose rail service. The impact of higher feed costs on livestock production would not exceed 0.5 percent of total costs.[38]

Employment. Recent evidence cites no significant impact on local employment as a result of low-density rail abandonments. In a review of a number of retrospective rail line abandonments, the Association of American Railroads found that the highway network in rural areas allows workers to commute substantial distances to new employment opportunities, and that low-density abandonments have had no significant impact on employment.[39]

NTPSC Special Report No. 1, on current transportation issues in the U.S., cites the employment impacts of rail abandonments as not potentially serious except in those communities with a concentration of rail employees, and even in those communities decreases in rail employment are likely to be compensated by increases in trucking employment.[40]

In a study of the economic effects of rail abandonments on selected communities, another author reported that, of the ten communities studied, only two perceived significant short-run impacts on employment.[41]

A recent DOT study of employment impacts of eased rail abandonment policies likened the impact to that of deregulation generally. It calculated that 1,700 jobs would be affected, at a total payroll bill of $32 million. Those employees affected would be protected by labor protection provisions. These estimates of employees affected do not take into account any resulting increases in employment in trucking.[42]

Regional Development. The projected impacts of increased rail abandonments on employment have implications for community growth and economic development. The AAR's review of recent abandonment studies indicated that abandonment of branchlines has had little or no impact on economic development of the affected communities.[43] A survey of 71 abandonments in Iowa revealed little effect on employment and business or community growth.[44] In another survey of 10 abandoned communities, even in those instances where the price of products increased as a result, the residents continued to buy the products, at the higher prices, rather than purchasing in other rail-served communities. Although some firms changed their plans and did not locate in the affected communities, almost all of the communities surveyed added one or more firms after the termination of rail service.[45]

Energy Conservation. A study done by the Public Interest Economics Center (PIE–C) found that considering both the direct impact on fuel consumption by rail and motor carriers, and the indirect impact on demand for more or less energy-intensive transportation equipment as a result of modal shifts, the impact of rail abandonments on energy consumption was insignificant.[46]

A survey of abandoned lines in Iowa found mixed impacts on fuel consumption depending on whether truck service was substituted only for the branchline service or whether longer-haul truck service was used. Fuel consumption increased in those cases where grain was trucked further distances following abandonment. In those instances where the grain was shipped by truck to the same market as was used before rail abandonment, fuel consumption decreased significantly.[47]

Truck transportation is often more efficient than rail for short-haul movements, such as branchline operations would involve. Other things being equal, trucks are more fuel efficient for shipments of less than 132 tons and distances less than 15 miles.[48]

Environmental Protection. The impact of eased rail branchline abandonment derives in part from the impact on energy consumption. There are three main potential sources of environmental degradation associated with rail abandonments: air emissions from rail and trucks; noise pollution from rail and trucks; and increased need for highway maintenance and construction. The Public Interest Economic Center found any impact on fuel consumption to be insignificant, and concluded that any impact on air emissions must also be insignificant.[49] With regard to noise pollution, PIE–C found that neither trucks nor rail noise present a health hazard. Further, the noise levels emitted by both modes are similar, and therefore, any shift from rail to truck as a result of rail abandonments would have no significant impact on noise pollution.[50] PIE–C's findings suggest that the impact on the environment of increased highway maintenance and construction would also be insignificant; usually truck traffic changes are not expected to be great enough to warrant increased highway maintenance or construction.[51]

Trucks

NTPSC Policy Recommendations

The NTPSC's policies for motor-carrier regulation would allow eased entry into certificated motor common and contract carriage and provide regulated carriers with pricing freedom within an expanding zone of reasonableness to be established by Congress. On the one hand, these policies open the highways to new truckers and other common carriers, thereby increasing the risk of accidents and, accordingly, the incidence of personal injury and property damage. On the other hand, the new rate freedom is likely to intensify price competition—a goal of deregulation—but it is also likely that some carriers, if pressed financially, will be tempted to "cut corners" in the area of safety. Additional safeguards to life and property on the highways of the nation may be needed.

IMPACTS

The impacts of trucking deregulation are highly controversial. Nonetheless, the NTPSC evaluation of the evidence suggests that regulatory reform will be largely beneficial to trucking interests (improved productivity) and to users (more price-service options) while not being detrimental to competing modes (if these modes, especially railroads, are simultaneously deregulated and if the NTPSC financing, pricing, and taxation reforms are also enacted).

EFFICIENCY

The American Trucking Associations (ATA) argue that deregulation would increase the number of truckers handling the same amount of freight, creating excess capacity and using more fuel.[52] However, evidence indicates both that new freight will be generated and shifts of freight among trucking types will occur as prices adjust.[53]

Efficiency gains from regulatory reforms include the increased ability of truckers to fill backhauls. Studies show that regulated trucking firms do travel while empty,[54] but the extent of empty backhauls may be less than commonly believed. AAR data reveal that for long-haul truck movement, both regulated and unregulated trucking is usually filled (e.g. about 90 percent of the time).[55] As 100-percent loaded movements would be impractical, these figures support the view that deregulation might not yield great and immediate efficiency gains to all truckers through filling empty backhauls.

The AAR data may permit studies of commodity flows by direction, so that analyses could show the potential for using fewer vehicles to handle the traffic in particular corridors. Data from the continuing traffic studies of rate bureaus may also facilitate such analyses.[56]

RATES AND PRICES

A Department of Agriculture study has shown that following the exemption of particular agricultural commodities, rates declined (e.g., frozen fruits and vegetables by 19 percent, fresh poultry by 33 percent, and frozen poultry by 36 percent) with reduced stop-off charges as well.[57] In addition, evidence from Canada shows higher rates in provinces with stricter regulation.[58]

An examination of the rates of return of various types of trucking may show where future competition might bring rate decreases as a result of the zone of reasonableness concept. The average return on equity for carriers of general commodities in 1977 was 16.36 percent. A rate reduction of 0.4 percent could reduce this to the new ICC standard of a 14 percent rate of return on equity. Long-haul carriers with very large revenues (over $10 million/year) showed returns of 21.14 percent on equity in 1977, which includes the nationwide carriers of LTL freight. Rate reductions of 1 1/2 percent would have been required in 1977 to reduce this return on equity to 14 percent. Higher returns are evident in certain regions (e.g. Southern, Midwestern, Southwestern, and Rocky Mountain ICC regions). Regulatory reform may provide relatively greater rate reductions in these regions.[59]

A study conducted using data from New Jersey (a state with unregulated intrastate motor carrier service) found that large shipping firms received discounts of between 9.7 and 15.2 percent of the applicable interstate tariffs when they dealt with non-ICC regulated intrastate carriers, and smaller shippers received discounts of between 8.5 and 11.4 percent. Still, the regulated tariffs may serve as a floor even for non-regulated firms, as 70 percent of regulated carriers and 45 percent of non-regulated carriers used the Middle Atlantic Tariff or used it as a base for negotiations.[60]

Nonetheless, the New Jersey intrastate firms had better operating ratios (88.11) than the ICC certificated sector (95.92). The unregulated firms were smaller, and more non-union, than the ICC regulated firms.[61]

New ratemaking freedom should result in rates based more on costs associated with distance, weight, volume and direction, versus the present structure that perpetuates rate-setting by commodity-type. Separate charges for pick-up, delivery, and line haul would be expected, and easily damaged goods would experience increased rate differentials.

SAFETY

In an effort to come to grips with an existing national transportation problem and mitigate any possible effects of the new regulation policies proposed, NTPSC's policies would condition the right of motor carriers to operate (as distinguished from the present requirement to obtain operating authority) upon demonstration of adequate insurance (or proof of financial responsibility equal to that required by insurance regulations)—covering public liability, property damage, cargo (for other than private carriers), and environmental restoration—and demonstration of payment of the Federal heavy vehicle use-tax to state registration agencies. Collection would be a cooperative Federal and state effort financed in part by sharing the proceeds of that tax. For certificated motor carriers, adequate insurance (or proof of financial responsibility equal to that required by insurance regulations) should be a minimum of $1 million for a single occurrence, or some other minimum amount sufficient to require periodic "on site" inspection by an insurance company. The minimum should be updated regularly. Non-certificated motor carriers and other modes would be subject to similar requirements.

At the Federal level, motor carrier safety regulation and its enforcement is the duty of DOT.[62] Unfortunately, there is evidence that the Bureau of Motor Carrier Safety does not have personnel or funds to enable it effectively to enforce these regulations.

For example, at one of the largest unannounced roadside inspections conducted by DOT on Interstate 80 near Berwick, Pennsylvania, on August 7–11, 1978, it was found upon the inspection of 676 vehicles, that 352 (52 percent) had to be placed "out-of-service" for one or more violations. The principal defect was brakes. In addition, 271 driver "hours of service" violations were detected and 25 drivers placed out-of-service; 63 percent of all exempt and 55 percent of all authorized for-hire vehicles and drivers were declared out-of-service.[63]

A year earlier the GAO reported to Congress that:

> In view of the limited accident data being obtained, the continuing infrequence of safety inspections, and the high ratios of trucks taken out of service after inspection, little assurance exists that most motor carriers are operating in compliance with Federal safety regulations.[64]
> The GAO report noted the ratio of commercial vehicles to Federal safety inspectors was about 32,000 to 1, and the ratio of the number of carrier firms to investigators was about 1,300 to 1. Not only were the number of vehicles and carriers inspected only a fraction of the total, but the method of selecting carriers for inspection was not directed to "known-high-risk-elements of the industry."[65]

The drivers themselves affirm that Federal safety standards are not being enforced and that exempt carriers lead the industry in violations. In a survey of about 10,500 of the nation's truck drivers, one researcher found that nearly half of the exempt carriers who violate the BMCS hours of service rules do so by using multiple log books (32.74 percent), by regularly misrepresenting logs (44.94 percent), and by regularly driving beyond the 10-hour limit (45.98 percent). At the other end of the scale, corresponding figures for company-employed common carrier drivers were 1.87 percent, 4.27 percent and 2.48 percent, respectively.[66]

ENERGY

Fuel savings from less regulation of trucking have been estimated as 22 million barrels per year, with most gains accruing to private carriers and regulated less-than-truckload (LTL) carriers that are most likely to travel fewer empty miles under deregulation. Relatively little fuel gain would be experienced by regulated truck-load (TL) carriers that are more fully loaded in today's regulated environment.[67]

ADEQUATE SERVICE

Within New Jersey, 97 percent of shippers reported that intrastate (unregulated) service was as good or better than regulated interstate service.[68] Service to small communities may improve with deregulation.[69] Following the implementation of the NTPSC policies, entry into the interstate LTL business may occur by such small intrastate firms, by newly expanded freight forwarders, and by expansion and merger of existing LTL interstate firms, resulting in less interlining. Regarding stability of the industry, the New Jersey study found the average age of unregulated intrastate firms to be 18.43 years.[70] A study of the exempt (agricultural) trucking sector found no more frequent exit from that industry than for similar industries.[71] Another study found the average age of exempt livestock trucking firms to be 18 years.[72] Thus, fears of excessive turnover in a deregulated environment should not be realized.

On the other hand, monopoly should not occur either, as most studies have shown constant returns to scale, although economies may exist for the LTL sector for short hauls.[73]

EMPLOYMENT

Average compensation for regulated trucking firms (often using union drivers) is substantially above that for non-regulated firms, as shown in a 1975 study.[74]

	Regulated	Non-Regulated	% Difference
Old Class I ($1–5 million per year annual revenues)	$11,099	$8,504	30.5
Old Class II ($300,000–$1 million)	10,033	7,566	32.6

At least one study documents that Teamsters Union members have gained from existing regulatory policies.[75]

INDUSTRY PROMOTION

Regulated trucking firms own certificates that have scarcity value. The ATA estimates their value may approximate 15 to 20 percent of the annual revenues of the firms that own them.[76] In 1972, operating rights of carriers with over $1 million in annual revenues were carried on their books at values of over $300 million, which may underestimate the market value.[77] Household goods certificates were estimated to be worth $60.8 million in 1977.[78] The value of these certificates can be expected to decline as new entry is permitted.

Intercity Bus

STATUS QUO POLICIES

The Interstate Commerce Commission (ICC) was given authority to regulate the intercity bus industry by the Motor Carrier Act of 1935 and currently regulates bus entry, operations and route changes, exit, and fares. In 1948, the Reed-Bulwinkle Act made joint fare-setting by rate bureaus legal and not subject to antitrust restriction. These acts provided the basis for most current regulation of intercity buses. It should be recognized that intercity bus firms often derive substantial revenues from package-express and charter operations, in addition to common-carrier passenger service. Problems in the industry which suggest reformed policies are listed below:

1. Very little intra-industry service competition exists;
2. The industry appears unable to achieve past rates of return under existing regulation;[79]
3. Cross-subsidy has been widely used by bus companies to continue to provide service that loses money in one area while making a profit on overall operations;
4. Intra-industry rate competition has been discouraged by tariff-filing requirements and certain rate bureau practices;
5. More than 1,750 communities have lost bus service over the past 10 years.[80]

Federal legislation in 1978 sought to aid the industry by authorizing (but not yet appropriating) funds for rural intercity bus service and terminal development, repealing the excise tax on buses and bus parts, and providing an exemption from the 4¢ per gallon Federal fuel tax.[81]

NTPSC Policy Recommendations

In the long term, the NTPSC recommends complete reform of regulation of intercity bus rates and rate bureau practices, entry (subject to compliance with safety, insurance and financial standards), and exit.

In the interim, these policies have been advocated by the NTPSC for intercity bus regulation:

1. *Increased rate flexibility including an expanding no-suspend zone of reasonableness to be established by Congress;*
2. *Easier entry of new carriers, or carriers offering new service on existing routes, with an increased burden of proof on protestants; and*
3. *Federal, state, and local cooperation to subsidize shortfalls for certain uneconomic routes where benefits exceed costs.*

These interim policies are designed to give established carriers the opportunity to adjust their operations to become fully competitive, and to permit new entrants where they are financially fit and can demonstrate adherence to safety and insurance rules.

Impacts

There have been no large-scale studies to date of anticipated impacts from intercity bus deregulation. Prior to the 1970s, few bus companies, their competitors, or their riders challenged the ICC's authority to regulate rates, routes, entry, and exit. Inflation, Amtrak, and a general decline in the intercity bus industry have changed that situation, and several studies have recently been completed or commissioned.[82]

Adequate Service. Regulatory reform of the intercity bus industry will probably improve service characteristics through more intra-industry competition. Whether service will become more accessible to all is debatable, especially in the rural market.

The intercity bus industry is dominated by two carriers, Greyhound and Trailways, each with coast-to-coast networks. Together they operate approximately 65 percent of all U.S. intercity bus passenger-miles and more than 80 percent of those operated by Class I carriers.[83] Most of their rural intercity routes feed into the cross-country network. Two schools of thought exist regarding the impact of deregulation on service. Concern has been voiced that when the large carriers drop most unprofitable, low-density routes (as they almost certainly will when given the chance), some affected communities may be left with no public transportation. It has also been argued that carriers will seek to serve only the densest passenger routes, or to provide only charter and package express service (which may yield higher returns than common carrier passenger service under existing regulations). Other observers contend that profit in the bus industry is not dependent on economies of scale, and smaller carriers, providing specialized service over a limited route, may well be profitable.[84] In this latter case, deregulation would allow easier entry of these small carriers, with no loss (and perhaps an increase) of service as large carriers leave the markets. A series of small networks might well provide better regional service than the existing networks geared to long-distance travel. Both the smaller and larger carriers, if given increased freedom to offer a variety of price and service options, can become more responsive to consumer demand.

The NTPSC policy recommending limited subsidization of service (on terms similar to those now aiding rail branchlines or essential, small community air service) will prevent mass abandonment of unprofitable routes in the interim, while removing the need for private carriers (or other passengers through cross-subsidy) to bear the losses.

Economic Efficiency. Economic efficiency should improve under regulatory reform. The proposed interim policy to provide subsidy on certain routes will prevent large carriers from abandoning uneconomic low-density routes, while relaxed entry and rate regulations should encourage entry of other firms that can provide profitable service. There is some concern by private intercity bus firms that federally subsidized rail, air, and bus carriers now may be competing unfairly. It should be noted that intercity bus firms are now eligible for Federal funding (at state and local option) under Section 18 of the UMT Act.[85] The NTPSC policies would seek to limit subsidies for all modes to those cases in which benefits of subsidy exceed costs, as determined using proper economic analysis.

Energy Conservation and Safety. Buses are, on the average, from two to seven times as fuel efficient as alternative modes (although comparisons based only on averages may be misleading).[86] To the extent that the proposed NTPSC regulatory reform policies encourage bus use at improved load factors, energy conservation will be favored. Similarly, bus safety records have been very impressive.[87] But recent projections have demonstrated that demand elasticity for intercity bus service has been very low on most routes (i.e. those with no direct competition),[88] and if such relationships hold, little impact on energy conservation or safety is expected through diversion from modes which are less energy efficient or less safe.

Regional Development. Of the 15,000 communities served by common carriers of passengers (air, bus, rail), some 14,000 are served only by bus.[89] A 1978 congressional report, *Intercity Bus Service in Small Communities,* offers a tentative conclusion, based on financial records of bus firms and consideration of the types of markets they serve, that service to rural communities does not appear to be less profitable than to large cities.[90] Thus, the NTPSC policy recommending simplified procedures for entering and leaving intercity bus markets should result in stable or increased service to rural regions not served by other modes.

Equity. Although intercity buses have been responsible for only about 2 percent of total intercity passenger-miles since 1970, figures show that up to 1976, they carried over 50 percent of total intercity passengers carried by public carriers.[91] Analysis by income and age reveals concentrations of student, retired, and low-income ridership not encountered in other modes (whose limited routes or high fares make them inaccessible to these groups). The NTPSC policies are designed to strengthen the bus industry, allowing it to continue to offer a service not provided by other public transport modes.

Environmental Protection. Buses compare very favorably with railroads[92] and other passenger modes in terms of environmental disruption. Where electrified rail is being compared to diesel-powered buses, different pollutants may be involved.[93]

Air Carriers

The deregulation of air cargo and passenger services occurred too recently to determine longer term consequences.[94] Earlier predictions included expected effects ranging from a loss of $660 million per year to a gain of $1,189 million per year in trunk air carrier profits.[95] Deregulation's effects on the number of flights is unclear, because low and flexible fares generate more passengers, but higher load factors.[96] Further predictions include an erosion of union power and the improved health of smaller short-haul air carriers relative to long-haul carriers in densely traveled markets.[97]

Regarding loss of service to small communities, the DOT (1976) and the CAB (1975) predicted little change, while the Air Transport Association predicted substantial reductions in service (1975).[98]

Mergers

RAILROAD (NEAR-TERM)

Status Quo Policy

Under Section 5(2) of the Interstate Commerce Act as amended in 1940, mergers between railroads must have ICC approval. The ICC must consider several factors in its decisions:

1. Effect of the merger on adequate transportation service;
2. Effect on the public interest of the inclusion or exclusion of other railroads in the territory of the proposed merger;
3. Total fixed charges resulting from the proposed merger; and
4. Effect on labor.

The ICC has discretion to weigh the relative importance of these considerations, and to consider other matters such as antitrust.[99]

It has been argued that the ICC interpretation of Section 5 of the Interstate Commerce Act has hindered railroad restructuring.[100] In its attempts to maintain adequate service, the ICC has often imposed protective conditions on mergers to minimize effects on other parties.[101] These protective conditions dilute the potential benefits of a merger and make restructuring less attractive. For example, during the 1950 merger proceeding *Detroit Toledo and Ironton RR Co., et al., Control, etc.*, 275 ICC 455, several railroads alleged the merger would deprive them of traffic and jeopardize their financial position and ability to serve the public. The ICC imposed six conditions on the merger, limiting the merged roads' ability to alter pre-merger traffic patterns. These, known as "Detroit, Toledo and Ironton Conditions" or "Standard Routing and Gateway Conditions," have been imposed on most mergers since 1950.[102]

It has also been argued that the ICC's failure to reach merger decisions in a reasonable length of time hinders needed rail restructuring. Between 1955 and 1972, the total time from initial filing with the ICC for merger, acquisition or control of two or more Class I railroads to final authorization ranged from 6 to 108 months.[103]

Title IV of the 4R Act added new rail merger procedures.[104] A key objective of the 4R Act is to expedite the merger process to encourage voluntary, privately initiated railroad restructuring. Differences in the 4R Act's merger procedure are:

1. The Secretary of Transportation conducts an initial analysis of the impact of the proposed merger on shippers, consumers, labor and geographical regions;
2. Public interest is the standard for ICC approval as opposed to the IC Act standards described above;
3. Once an application which has been reviewed by the Secretary is presented to the ICC, the Commission is directed to make a decision based on the public interest tests without concerning itself with inclusion applications;[105] and
4. Strict time limits have been specified for both the IC Act Merger Procedures (31 months total) and the 4R Act Expedited Railroad Merger Procedures (24 months after ICC's receipt of the Secretary's recommendations).

NTPSC Policy Recommendations

In accord with the 4R Act goal of encouraging voluntary, privately initiated railroad restructuring, the NTPSC believes there is a need to strengthen existing rail merger policy guidelines so that potential efficiency gains will not be jeopardized by uneconomic conditions placed on merger agreements. Specifically, the NTPSC recommends that proper economic analysis be used to carefully weigh the benefits of rationalization against possible costs to shippers and labor, and that mergers should be subject to reformed antitrust policies applicable to other sectors of the U.S. economy.

Impacts

Economic Efficiency. Corporations may consider merger in order to improve financial strength and profitability through changes in operations, to gain access to capital, and to expand service. In many cases a carrier can achieve gains only through investment. Such investment may upgrade or establish links between merged properties or redesign yards to accommodate traffic changes. If mergers are not burdened by involuntary inclusion of uneconomic assets and restrictions, and if the process can be concluded in reasonable time, a merger is more likely to achieve the potential economies inherent in the consolidation process.[106]

Service. There are several potential impacts on service. On the positive side, mergers that could improve service to the public are more likely to be initiated if there is reasonable assurance that few involuntary inclusions or uneconomic conditions will be imposed by the ICC.[107] On the other hand, if merger is used as a tool for resolving the marginal railroad problem, services of marginal carriers may be jeopardized by the merger.[108]

Equity. A potential difficulty in compressing the merger decision time period from 31 months is that proceedings can become greatly complicated through the filing of inconsistent applications and petitions for inclusion. If the ICC is required to dispose of petitions and applications within a shorter time limit, affected parties may be deprived of full opportunity to present their positions.[109]

MOTOR CARRIERS (NEAR-TERM)

Status Quo Policy

The ICC has exhibited an affinity towards approving trucking mergers.[110] Section 5(2) of the Interstate Commerce Act authorizes motor carriers to consolidate or merge, with ICC approval, if the proposed action is found to be just, reasonable, and in the public interest. Two basic criteria are used by the ICC to determine if consolidation is in the public interest: (1) the anticipated public benefits available from unification; and (2) the effect on competing carriers. The impact which a merger will have on competing truckers is controversial.

In order to comply with the congressional mandate of controlled entry, the ICC has taken the position that the service to be performed after the merger should be no greater than each carrier could have performed separately by means of interchange agreements. If the overall route authorization is greater than the prior combined route structures, a new competitive service has been created. For a new service, the ICC must decide if the benefits to the shipping public are greater than adverse impacts on protesting truckers before merger approval is granted.[111]

New service does not automatically mean a merger will be denied, but this position has caused restrictions to be placed on some motor carrier mergers which lessen service and profit potential.[112]

NTPSC Policy Recommendations

The NTPSC position is that in the near-term, the ICC (or its successor residual transportation regulatory agency) should strive to eliminate restrictions which lessen the service and profit potential of motor carrier mergers. There are at least two methods of achieving this goal while meeting the existing congressional mandate of entry control:

1. *Require strict burden of proof for protesting carriers who claim restrictions are required to protect their ability to meet common carrier obligations.*[113]
2. *Where there is conclusive proof of extensive damage to competing carriers, require merger applicants to make short-term indemnity payments to protestants, permitting a reasonable amount of time to adjust to the new competitive situation.*[114]

Impacts

Service. The primary advantage of trucking consolidation (particularly end-to-end) is the reduction in the amount of interlining required, improving customer service as a result of: reduced handling, less chance for damage and theft, faster service, improved scheduling, and faster tracing.[115] With fewer restrictions on merger agreements, the potential for service improvement increases.

Employment. Because the motor carrier industry is still growing, mergers do not adversely affect overall employment opportunities. One transportation labor leader said, "In the long run, mergers create jobs."[116]

LONG-RUN MERGER POLICIES

NTPSC Policy Recommendations

The NTPSC recommends that in the long-run, transportation mergers for all modes be subject to reformed antitrust laws that seek to increase the efficiency of the transportation sector and of the entire U.S. economy. Such antitrust policy should consider, to the extent they are measurable, gains in technical efficiency resulting from a merger. These gains would be weighed against any losses in allocative efficiency associated with potential monopolization of a market, such that mergers would be unlawful only where the costs exceeded the benefits. It should be noted, however, that current antitrust law does not weigh benefits against costs in assessing mergers. This NTPSC policy requires antitrust law, with respect to mergers, to be reformed at the same time that transportation mergers are brought under its jurisdiction.

The statute affecting the legality of corporate mergers, Section 7 of the Clayton Act, condemns mergers whose effect "may be substantially to lessen competition or tend to create a monopoly."[117] The category of mergers most relevant to the transportation industry is that of horizontal mergers; that is, those affecting one market. Section 7 has been interpreted by the courts to strike down horizontal mergers creating market shares of as little as 5 percent.[118]

A recent review of antitrust action, which generally supports more vigorous enforcement, cites the counterproductive impacts of Federal antitrust action with respect to mergers. The author suggests that Federal antitrust resources would be more productively spent on monopolization or trade-practice cases rather than on mergers.[119]

Subjecting transportation mergers to DOJ rather than ICC authority would mean that mergers would no longer need prior approval. To subject transportation mergers to market share standards may not be appropriate as an indicator of potential market dominance in the freight transportation industry, as discussed in a recent PIE–C paper on the benefits of rail deregulation.[120]

End-to-end mergers, which do not reduce competition in a particular market, may permit potential gains in technical efficiency to the affected carriers, with little potential for increased market power.[121] For this reason, an efficient antitrust policy with respect to transportation would presume most predominantly end-to-end mergers to be legal.

The efficiency impact of predominantly parallel mergers (as contrasted to end-to-end mergers) appears mixed.[122] Parallel mergers may result in cost savings to carriers, but may increase market power through reducing the number of carriers in the affected market. A key aspect of any DOJ actions with respect to transportation mergers would be definition of the relevant market. Intermodal and intramodal competition, geographical competition and potential for product substitutability, are but some of the factors which should be addressed in any determination of potential market power gains to result from a merger. An efficient antitrust policy would then weigh any efficiency losses (i.e., restrictions in output which may result from a merger) against potential efficiency gains. This is particularly relevant for railroad mergers, where a parallel merger of two carriers may leave only one rail carrier in a particular market, though no lessening of competition would result (when considering competition from other modes), and cost savings may result.

The future of trucking mergers hinges in part on motor-carrier regulatory policy. Past mergers have provided trucking companies with access to markets otherwise blocked by ICC entry restrictions. As entry is freed, motor carriers may prefer internal growth as a more cost-effective means for expansion. In the LTL sector of the trucking industry there is potential for both economies of scale and for monopolization if artificial barriers to entry persist. It is important that antitrust policy not preclude important service advantages associated with large terminal networks which may result from trucking mergers. At the same time, incumbent LTL carriers should not be permitted to monopolize markets through merger while new entrants are artificially barred from the market through regulatory restrictions.

Intermodalism

STATUS QUO POLICIES

There are numerous Federal regulations passed by Congress during the past 70 years which affect intermodal ownership and operations. The list includes:

1. Interstate Commerce Act (restricts rail ownership of other modes);
2. Panama Canal Act of 1912 (restricts rail-controlled water operations);[123]
3. Motor Carrier Act of 1935 (limits intermodal acquisitions of motor carriers);[124]
4. Transportation Act of 1940 (modifies Motor Carrier Act provisions to apply only to rail carrier acquisitions of motor carriers. Also restricts rail and pipeline participation in water carriage);[125] and
5. Federal Aviation Act of 1958 (restricts surface carriers from engaging in direct air carriage).[126]

Each intermodal restriction resulted from an attempt by Congress to protect a particular mode from domination by more established modes of transportation. In most instances congressional directives provided agencies with a wide latitude for action. On a number of occasions, without success, the regulatory agencies have asked Congress for specific clarifying legislation.[127]

As a result, some Federal agencies have recently taken initiative to further the concept of intermodal cooperation and coordination within the context of existing regulation. In early 1978, the ICC approved a single-rate barge/rail tariff arrived at by a railroad and a barge firm in Iowa. Unlike previously hostile encounters between modes, these two firms joined together voluntarily and designed an innovative tariff to save Iowa shippers 2 or 3 cents per bushel in transporting grain to New Orleans.[128]

Also in 1978, a "Memorandum of Staff Agreement" was signed by the managing directors of the ICC and the Federal Maritime Commission (FMC) ". . . to establish cooperative internal procedures . . . in intermodal matters in which each agency has an interest."[129]

In early 1979 the ICC released proposals concerning deregulation of intermodal services, requesting shipper and carrier comments before a legislative package is presented to Congress. The proposals encompass:

1. Repeal of the section of the Interstate Commerce Act that "prohibits common control or ownership of railroads and water carriers operating through the Panama Canal";[130]
2. Ending of regulations over barge and intercoastal tariffs so that such carriers "could establish through routes and joint rates with regulated carriers of other modes . . . and could provide substituted service for other surface carriers." Note that in this proposal deregulation of rate and tariff filing is tied to deregulation of carriers concerned with intermodal operations. This would not be necessary. Simply deregulating rates and tariffs would result in added efficiency with no added costs, and yield quantifiable economic data on the effects of single-filed tariffs in intermodal movements.[131]

The ICC hopes that such proposals will encourage the participation of carriers in joint intermodal services, in a way that current regulation has failed to do.

Probably the most progressive intermodal ownership policy of any agency is that adopted by the CAB in cases involving surface carrier participation in air freight forwarding. The Board's policy has been evolutionary, but with the expressed goal of protecting competition, not competitors. This evolution has been possible because, unlike the Interstate Commerce Act, the Civil Aeronautics Act does not contain specific provisions which demand congressional approval for modification.[132]

INTERMODAL EXAMPLE: RAIL PIGGYBACK SERVICE

Piggyback service, which involves trailer-on-flat car or container-on-flat car (TOFC or COFC) movements, is the most widely used form of intermodal domestic freight transportation. Although loaded trailers were moved on rail flatcars as early as 1926, modern piggyback service did not begin until the late 1950s. Between 1970 and 1978, piggyback traffic (as a percent of total rail carloadings) rose from 5.3 percent to 7.9 percent,[133] though in 1974 such traffic constituted only about one percent of total intercity freight volume.[134] In recent proceedings the ICC has settled on these basic conditions for rail control of motor-carrier service:

1. Trucking service may be performed to and from but not between specified "key points" or major traffic centers;
2. Operations must be limited to service at stations on the rail line;

3. Truck traffic must be connected with a prior or subsequent rail haul; and
4. Traffic must move on rail rates and rail billing.[135]

Although designed to ensure that any rail-contracted truck operation will be substituted service, and traffic will not be taken from competing trucking companies, the first two of these conditions inhibit TOFC service by limiting the potential of all-railroad-supplied TOFC to only those areas surrounding established railroad stations and by requiring a ramp at every "key point," despite economic dictates.

NTPSC Recommended Policies

The NTPSC recommends regulatory reform to eliminate Federal impediments to intermodalism in general, while promoting effective joint rates and through service within and among modes. The following specific policies have been proposed to further the general goal of enhanced intermodalism:

1. *Federal impediments to common ownership and intermodal coordination and cooperation should be eliminated (although some restraints on common ownership may be necessary to preserve competition);*
2. *A common definition of 'through bill of lading' should be adopted by Federal agencies;*
3. *Differences between CAB, ICC, and FMC publications of regulations affecting through rates should be eliminated; and*
4. *Cargo liability laws should undergo further standardization.*

IMPACTS

Adequate Service

Service is likely to improve under the proposed NTPSC policies encouraging more extensive transportation integration. In the event of poor TOFC service by intermodally-controlled firms, independent truckers offering superior service could enter the affected market. With fuller cooperation between modes, options available to shippers would be increased, thus improving their ability to "customize" various shipments according to current need at prices reflective of costs.

Appropriate Rates/Prices

It is probable that extensive transportation integration would lower consumer transportation prices. An example is the 2 to 3 cents per bushel savings experienced by Iowa shippers using rail and barge under a single-rate tariff (mentioned above). The NTPSC policy recommending a common definition of "through bill of lading" for Federal agencies should significantly improve the opportunities for additional intermodal cooperation with similar reductions in rates.

Economic Efficiency

In a 1975 study by Reebie Associates for the FRA it was estimated that a national intermodal network could save consumers up to $163 million in transportation charges by 1985. These savings are heavily dependent on the effect of increased intermodalism on existing modes, equipment needs and utilization, and pricing policies.[136] Three factors have been noted which might limit the efficiency of increased intermodal traffic (especially TOFC):

1. Overcapacity related to an imbalance of traffic flows;
2. Unclear impact on existing carload rail traffic and resulting rail revenues;
3. Need for intermodal equipment and other car types has not been established.[137]

Equity

To the extent that encouragement of intermodalism would reduce modal discrimination in existing U.S. statutes, the recommended NTPSC policies would result in greater equity among modes. Three examples of modal discrimination in existing regulation are:

1. Section 5(2)(b) of the Interstate Commerce Act applies only to rail carriers seeking to integrate with existing motor carriers;
2. Sections 5(14) to (16) apply only to rail carriers and pipelines seeking to engage in water carriage; and
3. Section 408 of the Civil Aeronautics Act applies only to surface carriers attempting to engage in direct air carriage.[138]

Industry Promotion and Protection

Protection of newer industries from competition has been a key to interpretation of regulations limiting intermodal ownership, but recently there has been active concern with protection of competition, even if that means losses for individual firms.

For example, trucking has traditionally opposed regulatory change that would permit rail entry into motor carriage on the grounds that railroads might combine pricing with service changes to eventually weaken the trucking industry. Present experience with two western railroads and their trucking subsidiaries would tend to disprove this theory. Santa Fe Industries and Southern Pacific Transportation Company, both rail-holding companies, are significant factors in western trucking operations. In the 40 years that they have been in operation, there has been no evidence that railroad involvement in motor carriage had damaging repercussions on the trucking industry.[139]

On the other hand, without the artificial protective shield currently provided by Federal legislation, there is little doubt that several smaller, less-profitable firms would be eliminated or relegated to rather limited types of carriage where their service has been shown to be inferior to that of the larger integrated companies.[140]

Employment

Intermodal cooperation, especially piggybacking, has been consistently opposed by affected labor unions. Increased use of containerization tends to lead to reduced employment as capital expenditures (in the form of containers or trailers and the special equipment needed to move them) are substituted for labor.

The Maritime Administration (MarAd) has examined the relationship between the extent of containerization and unemployment at U.S. ports. The most severe drop in longshore employment between 1960 and 1976 was at the Port of New York, the world's largest container port. Overall, since the introduction of the container to the shipping industry in the late 1950s, there has been a steady increase in labor productivity (50 percent between 1967 and 1975) but a decrease in longshore employment (23 percent between 1960 and 1976).[141]

Energy, Environment, and Safety

The NTPSC's proposed policies would be a preliminary step to formation of a national intermodal network. Studies of energy savings from such a system were made by Reebie Associates. Annual savings of 75 million gallons of fuel (0.4 percent of predicted total consumption for intercity freight transportation) were forecast due to diversion of traffic to more fuel-efficient TOFC operations.[142] The specific policy of easing piggyback restrictions, if reduced intercity trucking operations resulted, would improve levels of pollution and congestion, and safety performance.[143]

Innovation

STATUS QUO POLICY

Innovative transportation changes are affected by a variety of factors including market structure, demand, capital availability, labor pressures, and government regulation. It has been argued that innovation is not as rapid as it should be, due in part to the impact of economic regulation. Although there has been no complete analysis of the relationship between regulation and innovation[144] examples can be cited which suggest that regulation can have an adverse impact on the implementation of new techniques and technology, especially for railroads, and to a lesser extent for pipeline and air.[145]

Rail

External control of rate changes is believed to be an impediment to innovation. The ICC frequently assesses the "justness and reasonableness" of rate changes based on historical average costs which may not reflect cost savings available through innovation. By prohibiting a carrier from adopting lower rates which could generate the traffic increase necessary to provide justification for an innovation, the ICC may have prevented some innovative changes.[146]

One example of how economic regulation distorts investment decisions is the introduction of 100-ton-capacity rail freight cars. The larger capacity car permitted an indirect means of reducing rates to large shippers on a per-ton basis, even though the traffic could be handled almost as efficiently with existing standard-size cars.[147] Carriers wished to use these cars and reduce rates to large shippers of dense materials, reflecting the economies of bulk handling, but feared ICC action against rate reductions.

The case of the "Big John" cars is a striking example of how regulation can delay introduction of an innovative technology. In 1961 Southern Railway published tariffs for new "Big John" grain cars which were 60 percent below previous rates. Complaints from competing shippers delayed approval until 1962. The decision was subsequently reviewed and reversed by the ICC, initiating a series of court battles. Four years after the initial petition, rate reductions for "Big John" grain traffic were approved.[148] Aside from deterring one specific innovation, time delays such as this entail frustrations and costs which may discourage management from attempting to introduce new technology.

Some investigators believe that the introduction of unit trains in the East was delayed by at least five years by the regulatory process.[149] Cost analysis of unit trainload shipments of coal, grain and iron ore indicated that substantial savings were possible. To introduce the service, lower rates were needed to induce shippers to maintain larger inventories and loading facilities required by unit loads. On the basis of prior regulatory policy, carriers assumed that if lower rates were offered for this service in one area, similar rate reductions would be required by the ICC in other areas, conceivably resulting in net revenue loss. Thus, there was no incentive to introduce unit train rates until demand increased to the point that the service was profitable regardless of uniform rate restrictions.[150]

Rate regulation is but one factor which inhibits innovation. Railroads are restricted in their ability to own other transportation modes while pipelines, water, and motor carriers are not.[151] The ICC has the power to approve or reject railroad ownership of truck lines. This policy may have slowed the development of domestic piggyback service compared to the large-scale introduction of this service in Canada which is unhampered by such restrictions.[152] The same policy may inhibit the widescale use of two promising future innovations, specialized intermodal rolling stock and automated intermodal terminals, which were identified by the NTPSC in Chapter 6 as key technologies.

The long history of economic regulation may have shaped the philosophy of rail management about innovation. Some argue that regulation, by transferring competition from market place to courtroom, has fostered a management concerned more with legal aspects than innovative changes in equipment or procedures. Employees also have a stake in technological improvements that may affect their jobs.[153]

Pipelines

Pipeline rate changes were assessed by the ICC on the basis of an established return on invested capital. To determine the rate base, the ICC emphasized the cost of reproducing invested capital, a policy which may have encouraged extended use of older equipment or discouraged the use of new capital which incorporates new technology.[154]

On the other hand, there are indications that pipeline innovation has been spurred by regulation of the railroads. The development of product pipelines was probably hastened by the shippers' desire to circumvent high rail rates. The Cadiz-Cleveland coal slurry pipeline was similarly motivated.[155]

Air

In general, past CAB policies encouraged service competition as a substitute for price competition. Thus, some new aircraft purchase decisions may have been biased in favor of passenger amenity characteristics rather than operating cost considerations.[156] Recent relaxation of economic regulations will revive price competition and foster innovations to enhance economic efficiency.

Motor Carriers

There is little indication that innovation in motor carriage is adversely affected by economic regulation. However, a publication of the Senate Committee on Governmental Affairs states that relaxation of entry restrictions would permit carriers with access to new technology to enter the market.[157]

NTPSC Policy Recommendations

The NTPSC recognizes that economic regulation can have deleterious effects on innovation. A case can be made that almost any regulation impacts technological change, by impeding or forcing innovations, or channeling the course of change. It is important that impacts on innovation are well understood.

The manner in which Federal economic regulatory policy inhibits or promotes the development and utilization of innovative technology in the transportation sector should be assessed for existing regulations and prior to establishing future regulatory policy. Regulatory impediments to innovation should be minimized.

IMPACTS

Adequate Service

Relaxation of economic constraints on innovation can have a positive effect on the pace of technological change and consequently on the variety of services available. Carriers able to reflect the costs of new technology in their rates have a greater incentive to discover and meet the demand for new services.[158] As an example, expansion of intermodal services such as TOFC/COFC is possible.

Economic Efficiency and Appropriate Rates/Prices

With greater freedom and more incentive to innovate, carriers are likely to choose methods that permit cost reduction. Thus a positive impact on economic efficiency is expected, assuring that future innovations are in society's economic interest.[159] With improved efficiency, positive impacts can be expected on fares, rates and costs for users and providers of transportation.

Industry Promotion

Railroads may have the most to gain from the NTPSC policy because available evidence indicates that they are most stifled by regulation. Innovation in the rail sector could lead to technological thrusts in competing modes, another spur to efficiency and service improvement for the entire freight transport system.

Employment

Greater automation of rail yard operations, and monitoring and control processes, as discussed in Chapter 6 of this report, can be expected to reduce the labor force now required for those tasks. On the other hand, deregulation may create new employment opportunities.

OTHER REGULATION

Safety

STATUS QUO POLICIES

Transportation safety has long been a concern of the Federal government. As in all situations involving socially unacceptable risks, government regulation of transport safety has taken three basic forms (after designating an agency to oversee the specific risk or accident cost reduction):[160]

1. The agency can produce and disseminate safety information. This has rarely been used exclusively in transportation, but has often been a complementary measure to mandatory standards (e.g., seat belts);
2. The agency can impose penalties, fees, insurance requirements, or quotas to deter unsafe conditions and the manufacture of unsafe products (the FAA's establishment of quotas at peaks to control the concentration of air carriers over busy airports is one example); and
3. The agency can set mandatory standards. This has been the primary approach of the agencies designated to solve transportation safety problems from rail car brakes, seat belts, and commercial air carrier instrumentation.

NTPSC Policy Recommendations

The NTPSC's concern, in the long-term, is that regulatory policies involving transportation safety be cost-effective relative to other life-saving programs, with objectives that are clearly stated and enforcement that is strict, effective and applied equally for all modes and carriers. In a nutshell:

> *. . . It is by no means clear that we should always be increasing our spending exponentially to shave the last few percentage points off the risks we happen to care most about at the moment.*[161]

Specific NTPSC recommendations that will lead to these goals are listed below.

1. *Retain DOT's central role in safety regulation and enforcement;*
2. *Provide Federal matching funds to states for enforcement with penalties for ineffective enforcement;*
3. *Share costs among all levels of government, the carriers, users, and others who benefit;*
4. *Increase penalties for carriers that do not meet standards, such as for rail cars, trucks, and tracks. (For example, Federal prosecutors in Wisconsin have begun to levy misdemeanor charges on executives of trucking firms for alleged safety violations, with possible felony charges for false statements);*[162]
5. *Tie certification of regulated carriers to verification of safety regulation compliance;*
6. *Require all certificated motor carriers to obtain insurance (or to maintain self-insurance of equal value) at levels sufficient to require on-site inspections by insurance firms;*
7. *Emphasize better maintenance of roads and bridges; and*
8. *Encourage training of local police and firefighters to deal with transportation accidents involving hazardous materials.*

IMPACTS

There have been very few studies, government or private, which have dealt with the balance of costs and benefits of existing or proposed transportation safety regulations. A documented analysis of the cost-effectiveness of 37 highway safety countermeasures was prepared by the U.S. Department of Transportation in 1976.[163] This report, *The National Highway Safety Needs Report,* ranked the countermeasures by cost of implementation, fatalities forestalled, and cost effectiveness over ten years. Because of the methodology developed in this report, motor vehicle safety regulations have been scrutinized more than those of other modes. Three other recent DOT studies include some mention of the costs and/or benefits of safety regulation.[164]

The FRA notes that since May 1978, the DOT has been conducting a zero-based review of its safety regulations, and that in December 1978, the Department proposed a full-scale revision of its freight-car safety standards.[165] The most troublesome problem in rail safety, deferment of track maintenance, has yet to be approached in a cost-benefit study, although the FRA reports a $4.15 billion accumulation of deferred maintenance over the past ten years.[166] Recent FAA proposals to broaden controls on air traffic[167] and DOT proposals to revise regulations governing truck drivers' hours-of-service[168] have been met by cost-benefit arguments by industry spokespersons.[169]

A GAO estimate of the costs of vehicle safety regulations administered by NHTSA shows costs of $40 per auto in 1966, rising to $246 per auto in 1973, and $386 per auto in 1974 (the 1974 figure includes $122 per auto for the seat belt-ignition interlock system). Cumulative costs between 1966 and 1973 were $13.4 billion ($2.9 billion for 1973 alone). The GAO concluded that for the earlier years these costs were well spent as measured in lives saved.[170]

Later estimates include that of a 1976 NHTSA survey, which showed auto manufacturers claimed an average $368 of added cost per vehicle resulting from current safety standards.[171] The Joint Economic Committee of Congress found costs of $666 per auto in 1978, or $7 billion total for safety and environmental features.[172] The NHTSA claims costs of only $250 per auto for safety equipment, or 5 percent of the overall price.[173]

Adequate Service

The recommended NTPSC safety regulation policies would have a mixed impact on service. Enforcement of track, road, bridge and vehicle maintenance standards should improve service reliability and speed, but may discourage carriers from continuing to serve less-used routes (e.g., to small communities) because of the increased cost of meeting the standards.

Appropriate Rates/Fares

Generally it has been assumed that increased safety is directly related to increased expenditures, which eventually affect rates and fares. On the other hand, a DOT proposal to revise locomotive, track, and signal standards is expected to provide both a reduction in regulatory burden and an improvement in rail safety.[174]

Industry Promotion and Protection

Proposed NTPSC policies will probably have a mixed impact in this goal area. The trucking industry has estimated that DOT's plan to limit duty tours of single drivers to 12 hours would cost 73 private fleets $74,000,000, including increases in labor costs and equipment.[175] But studies of the auto industry's response to the additional standards required since 1967 show that the ratio of net profit to net worth for the three major auto manufacturers has not declined (GM averaged over 15 percent per year), indicating economic strength of the companies during this period of auto regulation.[176]

Energy Conservation

The relationship between NTPSC's recommended safety policies and energy conservation is unclear in most cases. An exception is the policy supporting strict and effective enforcement which, if applied to the 55 mph national speed limit, may have a direct positive impact on fuel conservation in saving 1 to 2 percent of the gasoline used.[177] Nonetheless, the cost-effectiveness of the national speed limit has been repeatedly challenged.[178]

Equity

The recommended NTPSC safety policy requires that cost-effective standards and regulations be applied equally to all modes and carriers.

Energy

NTPSC Policy Recommendations

Energy is both an input to the transportation system and a commodity transported by that system. The NTPSC has proposed a basic energy policy (simply stated: deregulation) that will have great impact on the transportation system. The NTPSC has also proposed transportation policies that will have measurable impacts on energy demand, supply, and prices. These latter impacts are reported in each section describing the particular transportation policies.

STATUS QUO POLICIES

Existing energy policy is complex. Regulations affect energy supply, demand, price, movement, and distribution. Adding to the complexity is the fact that foreign policy considerations play a major role in energy policy. For example, in response to feared petroleum shortages during turmoil in Iran, President Carter proposed in 1979 a contingency plan that, if approved by Congress, would permit rationing of fuels using resalable coupons.[179] DOE intervention in 1978 in proposed contracts involving purchase by U.S. firms of Mexican natural gas is another example.[180]

Current Federal energy policy, although hard to define exactly, relies on extensive regulations. Prices at which "old" or "new" domestic crude may be sold are specified.[181] A system involving entitlements equalizes costs to refineries to compensate for the varying controlled prices of domestic and foreign petroleum.[182] Prices of gasoline, kerosene-based jet fuel, and aviation gasoline have been controlled (although jet fuels are now deregulated), and price controls for other fuels are due to expire.[183] President Carter announced that the remaining controls will be phased out beginning July 1, 1979. The prices that may be charged for transporting fuels, as is true for most other commodities, will remain subject to regulation by the ICC, FERC, and state regulatory bodies.[184]

IMPACTS

The models used by the NTPSC to provide its baseline transportation forecasts assumed a largely unconstrained energy market. However, the responsiveness of transport supply and demand to energy price changes was also assumed to be quite small in the NTPSC models. The NTPSC has recommended that, with the exception of the short-term retention of Federal fuel efficiency standards, most Federal economic regulations controlling energy markets should be ended. Thus, the NTPSC projections using the National Energy Model (NEM) do show, in great detail, the partial impacts of altering U.S. energy policy while retaining existing transportation policies. These models were not used, however, to show the combined effects of deregulation in the transportation and energy markets.

By way of comparison with the impact predictions derived from the NTPSC's NEM, these additional predictions were examined:

1. The end of the petroleum refining entitlements program would discourage consumption of imported oil.[185]

2. Ending ceiling prices on crude oil would permit additional U.S. production of about 1.1 million barrels per day by 1985 as producers respond to price incentives.[186]
3. The elimination of price controls would inhibit producers from withholding products from the market solely to await the possible future end of price controls.[187]
4. Gains from ending too much consumption of petroleum at regulated (low) prices are estimated at $1.5 billion.[188]
5. Decontrolled gasoline prices might rise 3.7¢ per gallon higher by 1980 than if gasoline controls were maintained.[189]
6. Deregulated gasoline prices might lead to increases of about 0.2 percent in CO and HC emissions.[190]
7. Deregulated gasoline prices that increase in the free market would reduce demand by 21,000 barrels per day for each cent-per-gallon increase.[191]
8. The annual cost of energy regulation that could be saved if regulation were eliminated equaled $50 million in 1977.[192]

The transportation sector is the largest consumer of petroleum (using about 50 percent of total petroleum but only about 25 percent of total energy consumed in the U.S. in a year), and the auto consumes about 80 percent of the petroleum used by transportation. Thus, it is important to consider the extent to which deregulation of energy markets will produce price responses that in turn affect automobile use and ownership. Such responses, or price elasticities, are important because if consumers' responses are elastic with respect to price, overall price changes will elicit large changes in driving behavior; if consumers' responses are inelastic, when fuel prices rise, consumption of motor fuels will not fall even with large price increases. The NTPSC's model capabilities (models that showed anticipated auto ownership and use in relation to varying energy prices) were supplemented by a projection technique that attached greater importance to relationships between personal income trends and automobile ownership and operation.[193]

Other analyses of energy price versus auto ownership and use were investigated. One example is a Charles River Associates report[194] which showed ranges of price elasticities for gasoline, jet fuel, and diesel fuel, at short-run and long-run intervals, and at 1972 and 1975 price levels, and for auto, truck, jet air, and rail modes. The figures were virtually all inelastic, more so in the short run. Demands for truck and rail diesel fuel were especially inelastic, being close to zero in most cases. In the long run, jet fuel purchases were shown to be slightly elastic at 1975 prices.

Another study reports a gasoline price elasticity of –0.2054 (higher than CRA short-run figures but lower than its long-run estimates) and predicts that a new 5¢ per gallon Federal fuel tax imposed in 1979, and increased at 5¢ increments each year to reach 50¢ by 1988, would save 1 million gallons of fuel per day by 1988, or 14 percent of what would otherwise have been consumed. The author's sensitivity analysis showed that if gasoline prices fell due to voluntary conservation or unemployment, the effect of increased prices on fuel use would be diminished.[195]

The National Highway Traffic Safety Administration reports annual estimates of the impacts of its fuel economy standards.[196] In at least one case, proposed standards were too stringent to be met by the vehicle producers according to the NHTSA timetable, so the standards were relaxed.[197]

Another standard, the 55 mile per hour speed limit, was enacted to encourage fuel conservation. This measure may have generated significant savings in lives as well, although research is not entirely conclusive.[198]

In the U.S., 13 billion gallons of diesel fuel were sold in 1978, up 10 percent from 1977, while 115 billion gallons of gasoline were sold, up 3.4 percent from 1977. Of the 170,000 filling stations in the U.S., it is estimated that 12,000 truck stops and 8,000 other stations now offer diesel fuel.[199] One impact of NTPSC's proposed deregulated energy policy is likely to be an increase in the retail outlets offering diesel fuel. Table 109 shows the projected growth in U.S. demand for transportation fuels, including diesel.

Production of energy involves safety risks. Estimates of these risks have proved to be very controversial. When considering the risks inherent in producing energy by various sources, as well as in

TABLE 109. **Growth in the demand for transportation fuels, 1947 to 1975 versus 1975 to 2000**

Fuel Type	Average Annual Growth (Percent)	
	Historical 1947 to 1975	Projected 1975 to 2000
Gasoline	4.1	–1.5
Diesel	7.4	5.0
Jet Fuel	[a]5.2	3.7
Bunker Marine	–0.2	3.4

SOURCE: U.S. Department of Energy, Energy Information Administration, *Annual Report to Congress 1977: Statistics and Trends of Energy Supply, Demand, and Prices*, Washington, D.C.: Government Printing Office, 1978, p. 33; and American Petroleum Institute, *Basic Petroleum Data Book*, Washington, D.C.: 1978, Section VII, Tables 11, 11a, and 13.

[a]The historic period is 1965 to 1975.

transporting the energy, wide variations in predicted impacts are possible. One recent study reported the risk of wind-generated energy to be several times greater than that of nuclear power.[200] The wind figure was high because the machinery must be fabricated and installed, and back-up generating capacity provided. Another estimate of energy risk is that of the Rasmussen Report,[201] giving the chance of a nuclear power station disaster at one in a thousand million. Obviously, recent problems at the Three Mile Island nuclear facility will call these estimates into question.

The NTPSC policies are designed to favor the private development of U.S. energy resources. Given relatively free energy markets, but transportation markets constrained by existing regulatory structures, the NTPSC projected great development of U.S. coal resources, rapid dieselization, and introduction of synthetic petroleum plants in the Northern Great Plains during the 1990s. The projected impacts of this policy involve substantial movement of coal by rail, with consequent bottlenecks and new investment needs, as well as impacts on the communities through which the traffic will pass. For example, it was suggested in Chapter 8 that for coal projected to be moved from the Powder River Valley region of Wyoming, certain rail carriers would need greatly expanded capacity by the year 2000. In the same chapter, future bottlenecks on the U.S. inland waterway system were identified, in many cases as the result of increased movement of energy resources. Most other studies of future coal movement have adopted a much shorter time horizon (in no cases beyond 1990).[202]

The NTPSC energy policies will stimulate new patterns of future energy movement in the U.S., largely through private market responses to price signals; its transportation policies should increase the likelihood that these new movements can be accommodated by private transportation systems. The NTPSC has proposed that for-hire carriers have entry and pricing freedom that should contribute to the profitability of these private enterprises, and enhance the likelihood that capital can be obtained from internal and non-government external sources. The NTPSC has proposed that users of all modes should be assessed fees that cover the costs of their use, including external costs. Thus, any community disruption associated with coal movement by rail would be assessed to shippers whose payments would compensate these communities. Proper user fees that vary with peak demand would also capitalize on existing systems and mitigate the need for new investment. The NTPSC recommendations for multimodal planning, involving state and local governments and the private sector, would also serve to reduce undesirable impacts associated with energy movement through facilitating private bargaining to reduce conflicts.

Adequate Service

Transportation is uniquely dependent upon petroleum-based fuels; other sectors of the economy have greater choice among fuel types for meeting their energy needs. Consequently, if higher petroleum prices cause other sectors to use less energy or switch to other fuels (for example, if electrical generation relies on coal and nuclear fuel rather than oil-based residual fuel), more petroleum will be available for the transportation sector.

The reliance by other sectors on coal for energy will impose the burden of moving massive amounts of coal on the transportation network, especially the railroads. It is predicted that a large fraction of this coal will come from mines in the West, involving great distances. To ensure the continued adequacy of service to non-coal shippers, increased capacity and capital expenditures will be required on certain lines. This issue was examined in detail by the NTPSC and is one of the prime consequences for the nation's shift away from natural petroleum to other energy sources, including synthetic petroleum. It is forecast that the growth in ton-miles of coal moved will increase at twice the average rate for intercity goods over the forecast period.

Equity

According to the work done by the NTPSC, the effects on low-income persons who rely on automobiles in a situation of rising fuel prices are complex. The Office of Technology Assessment has asserted that adverse impacts from deregulation could occur.[203]

Appropriate Rates

Based on fuel price forecasts supplied by the NEM model, estimates were made of transportation cost increases due to fuel price increases. The results are summarized in Table 110.

Energy prices were taken into account in several ways by the models used to forecast transportation activity by mode and market. The aggregate levels of transportation activity forecast by the NTPSC are not dependent on fuel prices. However, modal splits are responsive to operating costs, and accelerating fuel costs were taken into account, although it is difficult to quantify precisely the impacts of higher fuel prices.

It appears that for intercity freight and passenger movement the cost of fuel will have a small effect on operating costs and hence on modal shifts. In the urban passenger market, gasoline prices have helped determine the split between travel by automobile and public transit. This split is dependent on an equation that considers both trip time and cost. Gasoline prices are fairly significant in determining the resulting shares.

TABLE 110. Forecast real fuel price increases in comparison with 1975 fuel costs as a percent of revenues, by mode, 1985 and 2000. Medium growth scenario

Mode	1985	2000
Intercity Truck	up 1%	up 3%
Rail	up 5%	up 4%
Domestic Water	up 1.3%	up 4%
Commercial Air	up 2.8%	up 6.4%
General Aviation	Fuel costs per hour of flight increase 11 percent.	Fuel costs per hour of flight increase 16 percent.
Automobiles	Fuel costs decrease 5 percent as a fraction of the personal vehicle bill.	Fuel costs decrease 12 percent as a fraction of the personal vehicle bill.

SOURCE: NTPSC forecasts discussed in Chapter 11.

NOTE: These projections assume a decontrolled energy market and report the growth of fuel prices compared to revenues in constant 1975 dollars. Recently, fuel prices have been accelerating rapidly.

Economic Efficiency

Deregulating energy prices causes fuel prices to reflect true economic values more accurately than occurs under regulation. To the extent that accurate fuel prices result, the transportation modes would more accurately reflect their true costs, and energy policy would not act to subsidize less energy-efficient modes, as probably occurs at the present time.

Energy Conservation and Development

Higher fuel prices should result in less fuel being consumed, other things being equal. The NEM model forecasts a higher rate of diesel engine utilization in the automobile market because changed fuel prices and other costs have made these engines preferable to those powered by gasoline. Additionally, it is anticipated by the Department of Energy that less driving will occur. DOE expects that for each 1 cent rise in gasoline prices, demand will decrease by 21,000 barrels per day.[204] Air travel will become more energy efficient partly as a result of technological developments spurred by higher energy prices.

Higher petroleum prices will cause other sectors—residential/commercial and industrial plus electrical generation—to switch to coal and nuclear fuels to meet part of their needs. The effect is to free additional petroleum fuels for transportation, which will be dependent on liquid fuels for the remainder of this century.

Higher petroleum prices will be an incentive for the development of syncrudes from coal and shale oil. These two sources of oil are forecast by the NTPSC to provide a significant fraction of the nation's energy supply by the year 2000, although the conversion of coal to crude oil involves serious energy losses.

Environmental Impacts

Environmental impacts are difficult to assess because of countervailing forces. On the one hand, higher prices should cause less travel, resulting in reduced aggregate emissions. On the other, higher fuel prices may increase pressure for relaxing environmental standards (or for not tightening them further) and may encourage misfueling of cars designed for non-leaded gasoline—if deregulation enlarges the gap between leaded and unleaded gasoline prices.

Increased oil extraction efforts will have environmental consequences. Greater amounts of drilling and exploration in frontier areas may occur if prices are allowed to reach market levels. The amount of oil production forecast for Alaska will require enlarging the pipeline across Alaska, with attendant environmental damage.

Also, a shift to coal appears to have serious environmental effects. The extraction, transport, and utilization of coal pose environmental problems. To the extent that the use of coal is encouraged because of petroleum price increases, the resulting problems need to be considered as part of the environmental costs of allowing petroleum prices to rise.

Safety

Higher fuel prices, to the extent that they reduce travel, may reduce fatalities.[205] Also, fuel conservation measures—such as the 55 mph speed limit—may have collateral safety value.[206] However, it is possible that some efforts to reduce fuel consumption—such as reducing automobile weight or allowing larger truck sizes and weights—may adversely affect safety. Also, expanded coal consumption will pose safety problems. More grade-crossing accidents would be expected as a consequence of increased unit-train movements of coal. This problem may be acute in the West, where many tracks go through towns and the amount of rail traffic could radically increase.

Environment

NTPSC Policy Recommendations

The NTPSC recommends that where environmental regulations are imposed, the free market should be allowed to operate so that prices may adjust to help recover the costs of meeting these regulations from those who create the costs or reap the benefits. Regional differences should be considered. The Federal role should include monitoring environmental conditions, mediating disputes, providing information, and facilitating planning. The DOT should coordinate such policies as far as they affect transportation. However, the NTPSC has not proposed that existing environmental regulations should be *repealed. The NTPSC has attempted to determine the impacts of these existing regulations so that in the future more cost-effective regulations can be chosen.*

IMPACTS OF AIR POLLUTION REGULATION

On a national basis, levels of pollution generated by urban passenger vehicles are projected by the NTPSC to decline until 1990, and then increase slightly due to increasing travel:[207]

Year	Urban Air Pollution
1975	142,600 metric tons daily
1980	120,500 metric tons daily
1990	59,000 metric tons daily
2000	62,500 metric tons daily

These estimates include all CO, HC, and NO_x emissions from urban passenger vehicles. Emissions for the other markets are, for the most part, unmeasured and are assumed insignificant in comparison to the urban passenger market.

The benefits of air pollution regulations that have influenced reduced emission levels are not fully calculated, but some indications exist of their costs, as summarized in Chapter 7.

IMPACTS OF NOISE POLLUTION REGULATIONS

The FAA uses benefit-cost analysis plus considerations of safety and technology to test the desirability of its proposed aircraft noise regulations. To determine the effect of its regulations requiring all civil subsonic aircraft to comply with FAR Part 36, the FAA weighed capital and operating costs against monetary measures of the benefits of reduced noise pollution as they accrue through the duration of the century.[208] The FAA concluded that the benefits of its aircraft noise compliance regulations greatly exceed the costs.

To regulate surface transportation vehicles, the EPA relies on an analysis of cost-effectiveness, rather than benefit-cost analysis.[209] The EPA assesses the benefits of its regulations in terms of reduced population exposure but does not provide a monetary measure of the benefits of reduced noise that can be weighed against the costs.[210] The EPA has summarized (Table 111) the economic costs of its existing and proposed regulations for each mode so they can be compared with one another. Costs presented should be regarded as "worst case estimates" as they do not take into consideration the reductions in fuel consumption likely to result from many of the EPA's proposals. Also, the benefits of improved health and welfare resulting from reduced noise must be considered.

Air

According to the FAA, as of 1976 the U.S. fleet consisted of some 2,100 large jet aircraft, of which 1,600 (about 3/4) did not comply with FAR Part 36 noise standards. Based upon a number of estimates, the FAA believes that possibly some 50 percent of these non-complying aircraft would be in service by 1990, if there were no Federal action.[211] The FAA estimated that the discounted present value of capital investment needed between 1975 and 1995 to bring all civil subsonic aircraft up to FAR Part 36 standards ranges from $176 million to $2.12 billion, depending upon whether the costs are estimated before or after taxes, whether aircraft are modified or replaced, and the assumed prices and discount rate used.[212] It should be noted that the FAA analysis was done before the deregulation of the airline industry and the recent surge in airplane orders, so the results should be interpreted with caution. See Table 112 for other costs.

Impact on aircraft manufacturers. The FAA estimates domestic aircraft purchases would range from $6 to $8 billion (1975 dollars) during the years 1975 to 1995. Compliance solely by modification would result in sales by aircraft manufacturers with a net present value of $295 million, whereas compliance involving replacement and modification would result in sales having a net present value of $1.49 to $1.7 billion.[213]

The FAA analyzed the impacts of its compliance program on employment in the aerospace industry from 1977 to 1986. A program involving only modifications of non-complying aircraft would generate 1,900 employee-years of new work. Combination replacement and modification programs would generate new employment in excess of 106,000 employee-years.[214]

Impact on air carriers. Airline operating costs are influenced by modifications or replacement of existing aircraft. The FAA states that the high-bypass turbofan technology now being placed in use has demonstrated 12 to 15 percent reductions in fuel consumption, with improved noise levels, compared to older aircraft. New technology involving improved materials and aerodynamic efficiency is predicted to lead to a further reduction of 10 to 15 percent.[215]

If aircraft were modified in order to comply with the FAA noise standards, airlines would experience negative net benefits and an approximate 1 percent increase in out-of-pocket operating costs due to a 15 percent fuel penalty from added weight. However, if airlines opt to replace aircraft, positive net benefits will accrue due to increased fuel efficiency and likely reductions in crew and maintenance expenses.[216]

Impact on air travelers. One bill passed by the House of Representatives in the 95th Congress (H.R. 8729) in order to finance replacement or retrofit of aircraft placed a 2 percent surcharge on domestic

TABLE 111. Economic impacts of EPA's existing and proposed surface transportation noise regulations, by mode or product

	Transport Mode or Product				
	Medium & Heavy Trucks	Motor Carriers	Railroads	Buses[c]	Motorcycles
Number of units produced in 1976	325,000	1 M in use in interstate commerce[a]	1,020 locos[b]	37,733	Estimated 1,017,000
Total sales of manufacturers in 1976	$7.016 B projected	N/A	$510 M for locos	Estimated $1 B value	Estimated $1.32 B
Number of manufacturers in 1976	11	N/A	2	18	40
Annualized costs:					
After market costs	—	—	—	—	$22–22 M
Capital costs	$104 M	1–time cost of $9.5 M	$0.86–1.03 M	$13–16 M	$75–143 M
Operating & maintenance costs	$121 M		$3.73 M	$49–53 M	$35–61 M
Total costs	$225 M		$4.6–4.8 M	$62–69 M	$132–226 M
Total annualized cost as a percent of sales	3.21%	N/A	0.9–0.94%	6.2–6.9%	10–17%
Employment impact	—	Negligible	Negligible	–600 persons	–2,530 to –5,400 persons[d]
Price increase (percent)	2.9%	N/A	0.8–0.9%	2.4–2.4%	2.8–8.8%
Units of lost sales (percent)	2.0%	Negligible	Negligible	1.2–1.2%	3.8–10.9%
Standard and year of effectiveness	83dBA 78 80dBA 82	By 10–15–75 88dBA runup 86dBA 35mph 90dBA 35mph	LOCOS:by'77 maintenance: 73dBA idle 93dBA stat. 96dBA mov. new: 70dBA idle 87dBA stat. 90dBA mov. RAIL CARS:by'77 88dBA 45mph 93dBA 45mph	EXTERNAL: 83dBA79 83dBA79 80dBA83 80dBA83 77dBA85 78dBA85 INTERNAL: 86dBA79 86dBA79 83dBA83 84dBA83 80dBA85 80dBA85	STANDARD & SMALL: 83dBA79 83dBA79 80dBA81 80dBA81 78dBA84 LARGE: 86dBA79 86dBA79 82dBA82
Firms experiencing difficulty	Capital shortage may affect small firms	Negligible	7 bankrupt absorb 22% cost; 11 marginal absorb 6% cost	2 school bus firms: Gillig and Crown	Harley to close down. CAN AM & all European (except possible BMW) out of U.S. market, 67% of manufacturers to close.

SOURCE: U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Surface Transportation Branch, Communication to National Transportation Policy Study Commission, 21 June 1978.

[a] For motor carriers, these data are the number of units in use in interstate commerce in 1973.

[b] These data are from the Association of American Railroads and are lower than the original estimate (1.089) used by EPA.

[c] For buses, these data show a decrease in demand for bus service.

[d] Does not include the 3,300 employees of Harley Davidson, because it is uncertain whether they can meet the first-choice regulatory level.

NOTE: For those products that did *not* have notice of final rulemaking published in the *Federal Register* before July 1977, a range of data for the first-choice and second-choice regulatory levels is presented.

TABLE 112. Possible ways of complying with FAR 36 and estimated costs, by aircraft type (millions of 1975 $)

	Capital Costs		Other Costs			
Aircraft Type	FAA Est.	DOT Est.	Lost Time Cost	Percent Increase in Direct Operating Costs	Percent Increase in Fuel Consumption	Annual Operating Cost per Seat
REPLACEMENT						
New Technology	20.0	—	—	—	—	.0184
	23.0	—	—	—	—	.0184
	26.0	—	—	—	—	.0184
727	10.0	—	—	—	—	.0002
DC–10	27.0	—	—	—	—	.0205
SAM[a]						
B–707	[b]$1.200	$1.200	$0.094	0.5	0.2	.0262
DC–8	[b]1.200	$1.020	0.102	0.6	0.2	.0262
B–727	0.225	0.225	0.0	0.1	0.0	—
B–737	0.270	0.264	0.0	0.2	0.0	—
DC–9	0.270	0.231	0.0	0.1	0.0	—
B–747	0.250	—	—	—	—	—
REFAN (Includes SAM)						
B–727	–	$2.250	$0.078	2.35	2.5	—
B–737	—	1,920	0.020	2.58	2.5	—
DC–9	—	1.270	0.028	2.52	0.5	—

SOURCE: National Academy of Sciences, National Research Council, *Noise Abatement: Policy Alternatives for Transportation,* Washington, D.C.: 1977, p. 166; and U.S. Federal Aviation Administration, *Final Environmental Impact Statement, FAR Part 36 Compliance Regulation,* Washington, D.C.: November 1976, pp. D–39 and D–40.

[a] SAM = Sound absorption material applied to engine nacelles.

[b] $1.2 million per aircraft if 270 aircraft modified; $2.6 million per aircraft if 100 aircraft are modified.

passenger air fares and freight way bills, a $2 surcharge per international departure from the U.S. where fares are less than $100, and a $10.00 surcharge for international departures where fares are $100 or greater.[217] In other bills considered, the ticket surcharge used to finance airport development included the amount that ticket prices need be raised to pay for aircraft noise control.[218] Some argue that given the airlines' profitability, there may be no need for special financing to retrofit or replace noisy aircraft.[219] Regardless of how the quieter aircraft are financed, noise regulation is likely to increase direct air travel costs in the short run. However, long run operating savings from the use of quieter, more fuel-efficient aircraft may reduce costs to users of air transport. It should be noted that in the long-term airlines would tend to purchase quieter aircraft, regardless of Federal noise regulations, because of their lower operating costs.

Impact on non-users of the system. Reduced population exposure to noise due to compliance with FAR Part 36 will result in benefits of reduced annoyance and reduced hearing loss. The monetary value of these benefits can be inferred from the expected reduction in damage awards from lawsuits and increase in property values near airports. The FAA estimates that compliance with its noise standards would result in benefits of reduced damage claims during the years from 1979 to 2000 worth from $3.5 to $12.8 billion (with discounted present value ranging from $1.2 to $3.4 billion) depending upon the noise reduction strategy. The range of the total increase in the value of property near airports is estimated to be from $92.6 million to $1.14 billion.[220]

Estimated net benefits. Comparing the airline capital and operating costs of noise control to the benefits of noise reduction, measured in terms of reduced lawsuits and increased property values, the FAA concluded that even in the least effective case of achieving noise reduction by only modifying aircraft, the benefits are three times the costs. The present (1975) value of costs to achieve compliance was $440 million compared to the present value of $1.2 billion in benefits from reduced noise.[221] If airlines were to replace rather than modify their JT–3D powered aircraft, operating savings would offset capital costs in the long run; there would be a $350 million benefit.[222] These net savings, when added to the benefits of reduced population exposure (with a present value of $3.6 billion), amount to $3.95 billion in net present value.[223]

Although the FAA's analysis indicates there are net benefits to comply with its regulations, there is uncertainty concerning future aviation noise levels; will air carriers opt for replacement of the aircraft, or for modification? What will be the growth in aviation and population?

Trucks, Railroads, Buses, and Motorcycles

The Noise Control Act of 1972 requires any regulations the EPA sets for surface transportation vehicles to reflect the degree of noise reduction achievable through application of the best available technology, taking into account the cost of compliance.[224] By cost of compliance, the EPA interprets Congress to mean the cost of identifying what action must be taken to meet the specified levels, the cost of taking that action, and any additional cost of operation and maintenance incurred. The costs of future replacement parts may also be considered.[225] For example, EPA promulgated two sets of regulations to control noise from medium and heavy trucks. The first includes standards that manufacturers must satisfy before the trucks are sold to motor carrier operators. The second applies to motor vehicles already in use. Table 111 summarized the EPA analyses of impacts.

Autos and Light Trucks

The EPA has not identified automobiles or light trucks as noise sources for regulatory purposes. (The EPA is required by law to publish noise control regulations within 2 years of identifying a noise source.)[226]

The EPA has become concerned that automobile and light truck noise is an increasingly dominant source of noise as other modes are regulated and there is a shift to diesel and four-cylinder autos. Diesel and four-cylinder engines are approximately 5 to 6 dB(A) noisier than standard-size eight-cylinder autos.[227]

The EPA has studies in progress to determine the major sources of noise from autos and light trucks. Too, EPA is developing baseline data for 1977 vehicles and is attempting to develop a means of quantifying vehicle operation in an urban environment to refine light vehicle noise measurement procedures. The Agency is reviewing the results of an impact analysis based on 1977 vehicle data. The outcome of this and other analysis is to be forwarded to the EPA administrator for a decision on whether to identify light vehicles as a major source of noise. If a regulation were issued, it would come early in 1981 and become effective with 1983 model-year vehicles.[228]

Some understanding of the costs of auto and light truck noise regulations in comparison to other modes can be gained by examining Table 113. Costs rise rapidly as regulatory levels become more stringent. Due to the far greater number of autos and light trucks nationwide, costs to control noise for these modes generally exceed by a large amount the costs to control other modes, although exact relationships vary depending upon the particular emission standards involved.

OWNERSHIP AND OPERATIONS

STATUS QUO POLICIES

The Federal government owns substantial amounts of equipment and facilities to serve civil and defense transportation needs. Examples include forest and park roads, locks and dams, motor pools, air traffic control centers and flight service stations, all military and two commercial airports, a merchant marine academy, and the Alaskan railroad. Substantial control of other facilities or services also exists (e.g., Amtrak).[229] Through Federal grants, state and local governments are encouraged to acquire transportation equipment and facilities and to provide transportation services.[230]

If the recommended NTPSC policies are applied, most aspects of Federal ownership and operation should remain the same, except that more effective user fees should be imposed. Nonetheless, in most cases, Federal ownership or operations should be viewed as a last resort, after all other alternatives have been explored and have been determined to be less cost-effective. In the view of the NTPSC, Federal nationalization of rail rights-of-way, for example, should not be pursued.[231]

The FRA has projected that between 1979 and 1985, private railroads (excluding Conrail) will fall $13 billion to $16 billion short of funds, and Conrail will require $2.6 billion in Federal funds in addition to the $3.3 billion already authorized.[232] Similarly, the existing Amtrak system of 27,500 route-miles would require $1.3 billion per year by 1984.[233] The DOT believes that with restructuring (not nationalization), a great reduction in these shortfalls can be achieved. For example, of the 198,000 rail route-miles in the U.S. (100,000 mainline miles), 40,000 route miles carry 67 percent of the freight by weight. For Amtrak, the proposed 43 percent reduction in route-miles should reduce ridership by only 9 percent, according to the DOT, and reduce the need for subsidy by $1.4 billion over the next 5 years. Restructuring, in combination with productivity improvements (such as the gains realized in the St. Louis terminal project) is favored by the NTPSC.[234]

TABLE 113. Estimated annual cost of noise reduction for compliance with regulatory levels 83 dBA, 80 dBA, and 75 dBA for buses and motorcycles, and 70 dBA, 67 dBA, and 65 dBA for autos and light trucks

Vehicle Type	Regulatory Level dBA	Total Population	Annual Production	Production Costs/ Vehicle (1975 $)	Annual Operating Costs/ Vehicle (1975 $)	Total Costs (1975 million $)
Intercity Bus	83 dBA	23,000	2,500	237	39	0.7
School Bus	83 dBA	310,000	33,500	23	9	1.1
Motorcycle 0–100cc	83 dBA	—	172,000	2	—	0.3
Motorcycle 100–200cc	83 dBA	—	282,000	10	—	2.8
Motorcycle >200cc	83 dBA	—	543,000	21	—	11.4
Automobiles	70 dBA	—	10,949,000	1	1	10.9
Light Trucks	70 dBA	—	1,999,000	3	1	6.0
Intercity Bus	80 dBA	23,000	2,500	393	97	1.2
School Bus	80 dBA	310,000	33,500	120	20	4.7
Motorcycle 0–100cc	80 dBA	—	172,000	4	—	0.7
Motorcycle 100–200cc	80 dBA	—	282,000	22	—	6.2
Motorcycle >200cc	80 dBA	—	543,000	39	—	21.2
Automobiles	67 dBA	—	10,949,000	15	—	164.2
Light Trucks	67 dBA	—	1,999,000	25	—	50.0
Intercity Bus	75 dBA	23,000	2,500	909	276	3.0
School Bus	75 dBA	310,000	33,500	443	101	16.9
Motorcycle 0–100cc	75 dBA	—	172,000	8	—	1.4
Motorcycle 100–200cc	75 dBA	—	282,000	30	—	8.5
Motorcycle >200cc	75 dBA	—	543,000	60	—	32.6
Automobiles	65 dBA	—	10,949,000	30	—	328.5
Light Trucks	65 dBA	—	1,999,000	50	—	100.0

SOURCE: National Research Council, *Noise Abatement: Policy Alternatives for Transportation,* Analytical Studies for the U.S. Environmental Protection Agency, Vol. VIII, Washington, D.C.: National Academy of Sciences, 1977, pp. 177–179.

The NTPSC policies also require improved coordination of transportation services provided by recipients of Federal grants. Cost-effective procedures and increased reliance on the private sector are recommended.

Regarding the NTPSC recommendation that ownership restrictions should not unduly inhibit foreign investment in U.S. transportation facilities, it should be noted that restrictions are much more detailed for the ocean shipping and aviation sectors than for the other modes. According to a GAO study, however, enforcement of these restrictions for at least one major program has been lax.[235]

AMTRAK

NTPSC Policy Recommendations

The NTPSC recommends that Amtrak management be given complete freedom to make adjustments to the route structure using the criteria set forth by Congress. Allowing Amtrak such flexibility would make it unnecessary for Congress to engage in drastic restructuring of the sort currently recommended by the DOT at Congress' request. The route structure should be re-focused to achieve more cost-effective performance. Amtrak should cut back substantially its long haul routes and concentrate in the short run on reducing its deficits by serving dense corridors, and in the long run on providing only that service which is determined to generate long-term benefits to society in excess of resource cost.

Impacts

ADEQUATE SERVICE

Termination of most Amtrak routes would not have a significant effect on intercity passenger service. A study conducted for the DOT found that, with one exception, alternate transportation is available to all cities served by Amtrak. The exception occurs on the Empire Builder route between Chicago and Seattle where air and bus transportation is infrequent and routings are often indirect. The study found that 40 percent of the passengers who rode the Empire Builder during 1978 (80,000 people) would have had no other reasonable public transportation available to them if the train had not operated.[236] The ambience of rail common carrier service, including such characteristics as greater space per passenger and the room to walk around, is often cited as an advantage

Amtrak holds over bus service. However, this advantage is not a benefit which can justify subsidies and, in fact, has a deleterious effect on fuel consumption and pollution.

Regarding more measurable aspects of service efficiency, Amtrak does not perform any better than its competitors and therefore, termination of certain Amtrak service will not significantly affect the level of service available to most intercity travelers. Air and bus perform at least as well as Amtrak in terms of on-time performance.[237] The auto and bus modes are "trip time competitive with rail in all but the longest distance routes."[238] Also, air and bus offer the traveler more choice in departure times than Amtrak in every market outside the Northeast Corridor (NEC).[239] Concentrating resources on corridor routes will significantly upgrade the quantity and quality of service to many Amtrak customers.

APPROPRIATE RATES/PRICES

At present, Amtrak fares rarely cover average cost. For the foreseeable future, fares subsidized in excess of external benefits (non-transportation benefits such as decreased energy consumption and increased safety generated by rail passenger service) appear to be necessary in order to operate most routes outside the NEC. Subsidization of Amtrak fares raises the question of whether these fares represent unfair competition with the bus industry.

Amtrak fares and services have diverted passengers from intercity buses, but diversion estimates differ from market to market. The GAO estimates the following range of passenger diversion to bus in the event of curtailed Amtrak services: Metroliner (in the Northeast corridor) 6.0 to 12.0 percent; conventional 16.7 to 33.3 percent; and outside the NEC, 16.7 percent to 33.3 percent.[240] The NTPSC estimates that if Amtrak service is terminated on short-haul routes, 10 percent of users will divert to bus and on long-haul routes, 25 percent would switch.[241] The GAO estimates that bus ridership would have been 5.5 percent to 10.9 percent greater if Amtrak had not been operating in 1976. By market, the range of increase would be 14.8 to 29.5 percent in the NEC and 4.6 to 9.1 percent in the rest of the U.S. The GAO estimates that a partial cutback (for example, one-quarter of all service outside the NEC) would add from 1.1 to 2.1 percent to the revenue passenger-miles (on regular routes) of Class I bus carriers.[242]

In addition to diverting passengers to bus, the elimination of some Amtrak service will probably affect bus fares. At present, in markets where bus and rail compete, bus companies have often chosen to establish fares lower than their standard fares specifically to meet Amtrak competition.[243] Terminating Amtrak service in the long-distance, interregional market where it is the sole public surface competitor of the two major bus companies might lead to higher bus fares. Amtrak has been an aggressive competitor with bus in short-haul corridor markets, particularly in the NEC where Amtrak competition has eliminated the traditional fare differential favoring buses,[244] but Amtrak service is probably not crucial to the maintenance of competitive behavior in long-haul markets. If free bus entry were allowed, as recommended by the NTPSC, competitive conditions would be retained. As the GAO points out, ". . . bus service is inherently very competitive in that the start-up expenses are very modest, and it is very easy to expand or contract service to meet market demand."[245]

The GAO concludes that Amtrak has put a damper on bus net operating income, an effect likely to intensify if Amtrak increases fares in accord with the Consumer Price Index rather than actual cost increases—an option not open to the unsubsidized bus companies.[246] The GAO concludes that net bus operating revenues would increase and profit would increase, particularly in the NEC, if Amtrak service were curtailed.[247] If Amtrak fares were raised to reduce subsidy requirements and restore the fare differential, bus company revenues would also increase either through higher fares or increased ridership at the same fare. The bus industry has experienced declining ridership and profits (of which Amtrak competition is a partial, but probably not a principal, cause), although results for the first quarter of 1979 have shown increased bus ridership and profits, perhaps as a result of automobile fuel shortages. Amtrak also reports increases in reservations for travel during the summer of 1979.

Eventually, appropriate fares for Amtrak must mean that the subsidy costs per trip will not exceed the marginal benefits. At present, only the NEC and perhaps a few other corridors seem destined to generate fare revenues plus external benefits equal to costs.

ECONOMIC EFFICIENCY

Cutting back long distance routes, which have little chance of ever breaking even, will bring Amtrak closer to efficient operation. Cutting back also means that Amtrak will have fewer incentive agreements to negotiate with railroads. However, labor protection payments would increase. In general, the development of upgraded corridor service will raise efficiency as Amtrak achieves greater market identification and service density in these areas and tests its true potential. At present, routes may be continued largely to preserve the notion that the U.S. should have a national, interconnected rail passenger system regardless of costs.

ENERGY

If it is assumed that all rail passengers would divert to the auto, and in addition, that energy use in the year 2000 will be less intense in automobiles and will remain the same on trains, the following predictions can be made. The change in energy use if all former Amtrak passengers on discontinued routes divert to auto with implementation of the DOT's recommended system would be 2,424,000 gallons (303 billion Btus) more in 1980 and a reduction of 3,614,400 gallons (451.8 billion Btus) in 2000. With implementation of a corridors-only system, the increase will be 8,357,600 gallons (1,044.7 billion Btus) in 1980 and a reduction of 19,879,200 gallons (2,484.9 billion Btus) in 2000. If all Amtrak service were eliminated, 12,401,600 gallons (1,550.2 billion Btus) more would be consumed in 1980, but 30,722,400 gallons (3,840.3 billion Btus) less would be consumed in 2000. The 1980 figure represents the maximum impact Amtrak cutbacks could have on energy use and yet it entails only a five hundredths of one percent annual increase in U.S. energy consumption.[248] The estimates above show that by the year 2000, energy-efficient automobiles might yield energy savings compared to travel by Amtrak.

Amtrak should not be considered a significant factor in energy conservation. It is unlikely that so severe an energy shortage could occur that rail would be absolutely essential to intercity passenger service. If a severe shortage did occur, Amtrak does not have the capacity to handle the extra passengers. Cutbacks in automobile travel for non-essential uses could ensure the availability of fuel for buses, airplanes, and cars. On any rail routes where passenger service is curtailed, the rights-of-way could be maintained for rail freight use so that service could be restored if the need arose and equipment were available. Equipment could be stockpiled for that eventuality. Of course, rail passenger service can cushion the effect of an energy shortage of the sort that occurred in 1974. However, the benefits of having rail service available when energy is temporarily in short supply do not appear to justify the large costs of retaining a national rail passenger network with extensive long-distance, interconnecting routes. Service should be retained only for the heavily travelled corridors and electrified routes where Amtrak's positive impact on energy consumption is greatest.

ENVIRONMENT

Reduction of Amtrak routes will increase the amount of pollutants emitted by intercity passenger travel. To quantify the increase in emissions of the four major pollutants (carbon monoxide, sulphur dioxide, nitrogen oxides, and hydrocarbons), it was assumed that all rail passengers divert to the auto mode where, like rail, pollutants are emitted in a stream throughout the trip. The increase in emissions with implementation of the DOT's recommended system would be 32.22 million pounds in 1980 and 0.114 million in 2000; with the corridors-only system, 110.98 million pounds in 1980 and 12.738 million in 2000; and, if all routes were eliminated, 164.8 million pounds in 1980 and 0.969 million pounds in 2000. The figures are based on average pounds of pollution emitted by rail and auto on long distance routes, where rail performance is poorest and auto performance is best. These data are valid for analyzing the impact of moving to the recommended corridors-only system because most routes cut by this restructuring would be long distance lines. (A complicating factor is that many passengers use long-distance Amtrak rates for short trips between cities.) Assuming that all Amtrak riders were on the less-polluting, short-distance routes and were diverted to the most-polluting, short-distance auto mode, the increase in emissions would be 273.01 million pounds in 1980 and 9.154 million in 2000. Compared with pollutants from other sources, as shown in Chapter 7, these are relatively small totals. The benefits of any quantity of pollution forestalled do depend on where and when the savings occur in relation to sensitive receptors. Pollution abatement cannot represent the sole, or even a significant, justification for the large subsidies to Amtrak.[249]

SAFETY

Eliminating Amtrak routes will have a negative impact on the safety of intercity passenger travel. If all rail passengers diverted to auto—the worst possible alternative in terms of safety—it is assumed that intercity passenger fatalities would increase directly with the number of passenger-miles, although increases would be smaller in the year 2000 due to improved auto safety. Using 1975 fatality rates, the increase in fatalities if all rail passengers diverted to auto with the implementation of the new DOT-recommended system would be 12 each year; with the corridors-only system, 41; and with all service eliminated, 61. Future savings of lives would be proportional to vehicle-miles traveled by various modes.[250] For the purposes of measuring the relative benefits and costs of Amtrak, each fatality could be assigned a 1975 dollar value of $400,000.[251] Even when this benefit is totaled, the safety impact of Amtrak remains slight when considered in terms of the overall safety of intercity common carrier passenger travel. If the present Amtrak system were totally eliminated and all passengers diverted to bus, there would be a net *savings* of three lives per year at 1975 rates.[252] While safety should be considered when evaluating the benefits of Amtrak, it is not a benefit significant enough to justify retaining all rail passenger service.

EMPLOYMENT

Labor protection agreements in the railroad industry require that payments be made to employees displaced by route cutbacks for up to six years following the cutbacks. These payments should be considered in determining the costs of eliminating service. The DOT's recommended budget groups labor protection payments under the capital appropriations category (which totals $171 million for FY 1980). In DOT's preliminary route restructuring report, labor protection payments were expected to range from $155 million to $640 million for its corridors-only system.[253] Despite the high initial labor protection costs of such cutbacks, cutting back to corridors-only service will be more economical and efficient in the long run.

INDUSTRY PROMOTION AND PROTECTION

Since creation of Amtrak in 1971, the Federal government has promoted and protected national intercity rail passenger service through extensive subsidy, enabling Amtrak to engage in capital improvements necessary to its survival. However, in the view of the NTPSC, at some point in the next few years, Amtrak must become financially independent of Federal support. Federal support should be limited to the amount that can be justified on the basis of public returns over and above those reflected in the revenue fares. This should be done even if it requires extensive service cutbacks.

REGIONAL AND URBAN DEVELOPMENT

Reduced Amtrak service will have little impact on regional or urban development. Conceivably, reductions might necessitate more highway development, but a study of the NEC high-speed rail system found that highway congestion is primarily an urban commuter problem little related to the intercity service Amtrak provides. In any case, Amtrak's ridership is in most instances too small, relative to the large number of auto users, to forestall highway expansion projects.[254] Similarly, Amtrak's ridership is too small and scheduling too infrequent for it to affect airport congestion significantly or necessitate airport expansion.[255]

EQUITY

Costs to develop accessible terminals can be quite large.[256] Users of present Amtrak service are more often in higher income classes than are users of intercity buses, so reductions of Amtrak service need not be regressive.[257]

COORDINATION

Federally Owned Vehicles and Services

NTPSC Policy Recommendations

NTPSC policies seek to establish more coordinated use of Federal vehicles, facilities, and services, especially during times of emergency. The NTPSC supports efforts already underway to facilitate coordination.

IMPACTS

Generally, emergencies are classified into two categories: defense (war or threat of war) and civil (disasters such as floods and fires). Virtually every department and agency in the Federal government has responsibilities upon Presidential declaration of a national emergency.[258] The three agencies primarily responsible for coordinating transportation are the Departments of Transportation (through the Office of Emergency Operations), Defense, and the new Federal Emergency Management Administration (FEMA). By combining a number of emergency agencies, including the Federal Preparedness Agency of the General Services Administration, the Defense Civil Preparedness Agency, and the Federal Disaster Assistance Administration into FEMA, the President's reorganization plan should significantly improve emergency coordination.[259]

Also to improve coordination, the Department of Defense recently updated and expanded its policy on requirements, allocations, priorities, and permits for DOD use of domestic civil transportation during emergency situations.[260] Continued improvements of this type to each agency's emergency plan are essential to coordinated utilization of vehicles and facilities.

The NTPSC-recommended policy should have a favorable impact on national defense. Secondary impacts should be in the areas of adequate service, economic efficiency, and industry promotion. These would be attributable to more efficient use of military vehicles during non-emergency times by the private sector. For example, the Defense Freight Railways Interchange Fleet (DFRIF) Program makes DOD-owned railcars available through leasing to commercial railroads.[261] The effectiveness of this program would be enhanced through improved coordination. Ensuring that the DFRIF program remains self-supporting, however, may require a revision of present rate agreements. If accomplished, the net result could be improved service and profit by the leasing railroad and reduced Federal spending. DOD has a similar program called Facility Sharing, which permits leasing unused military land to private organizations.[262]

Reorganization of GSA has produced a division called Transportation and Public Utilities Service (TPUS) which manages nearly 90,000 Federal vehicles in over 100 Federal motor pools.[263] Requests for these vehicles from DOD and DOT in times of emergency will now be submitted to FEMA which will issue permits and allocate vehicles.

The total number of Federal vehicles (owned and leased) is reaching gigantic proportions. GSA records reveal the government fleet to be more than 430,000 vehicles.[264] Total operating cost for fiscal year 1977 for Federal vehicles was nearly $700 million, and they consumed gasoline equivalent to 17,500,000 barrels of oil.[265] The NTPSC recommendation to seek better coordination should result in reducing this fleet.

DEPARTMENT OF DEFENSE[266]

The National Defense mission is vitally dependent on strong transportation systems capable of efficiently moving military material and personnel during both peacetime and war. The DOD is a large and unique shipper and currently spends approximately $5 billion a year for transportation services.[267] These services are provided worldwide to over 2,000 U.S. installations and defense contractors. The NTPSC policies that provide regulatory reform, proper user fees, and multimodal planning should be of importance to DOD.

The DOD transportation interests include:

1. *HIGHWAY*—Recent DOD assessments of strategic highway needs have identified 60,000 miles of Defense Strategic Highway Network (STRAHNET).[268] This includes 18,000 miles of highway corridors in addition to the Interstate System. Half of these requirements have been included in Federal-aid or state highway programs. This revised STRAHNET represents defense highway needs to the year 2000, but does not consider the possible contributions of other modes.
2. *RAIL*—In 1976 the DOD identified a 30,000-mile rail network strategically important to national defense.[269] In addition, DOD has identified some 243 installations for which rail service is essential.
3. *WATERWAY*—Analysis by the DOD has identified some 4,000 miles of the U.S. inland waterway system as important to the national defense.[270] The major importance of the inland waterways rests in the ability of the entire system to move quantities of bulk materials essential to the nation's industrial base. Defense requirements have been provided to the U.S. Army Corps of Engineers for its future use.
4. *AIRLIFT*—The Civil Reserve Air Fleet (CRAF)[271] program exists to help meet DOD emergency airlift requirements. The program provides stages of increasing mobilization. The CRAF program is a voluntary civil-military partnership in which the civil air carrier industry commits aircraft and crews to DOD in time of emergency. In peacetime, the carriers earn revenue through defense airlift contracts. After a national emergency is declared, 300 aircraft can be committed (about 20 percent of U.S. capacity).
5. *SEALIFT*[272]—The sealift necessary for the DOD upon mobilization (strategic sealift forces) would include ships of the U.S. Merchant Marine, the Military Sealift Command (MSC), the National Defense Reserve Fleet (NDRF), Effective U.S. Control (EUSC) fleet, and specifically committed NATO ships.

   There are approximately 290 dry-cargo ships and 240 tankers in the active, privately owned, U.S.-flag merchant fleet today. Another 26 dry-cargo ships and 22 tankers are in the inactive, privately owned, U.S.-flag merchant fleet. Five hundred and thirty-two of these ships can be used in support of military forces.

   There are 101 ships in the fleet controlled by MSC—65 in its nucleus fleet and 36 chartered from the U.S.-flag merchant fleet. Approximately 50 are suitable for strategic sealift.

   The NDRF consists of inactive merchant and ex-Navy ships maintained by the Maritime Administration. Included are 130 Victory ships, 9 SEATRAIN ships, and 5 C–3 type ships which have been identified for reactivation and use in a strategic role. These ships can be activated within 10 to 45 days.

   The U.S. has plans for the utilization of foreign-flag ships of the EUSC fleet. These are U.S.-owned or U.S.-controlled ships of foreign registry of 1,000 gross tons or more, which are under contract to MarAd and these can reasonably be expected to be made available for U.S. use in emergency. Although there are approximately 472 ships in this category, only 7 dry cargo ships and 156 tankers are desirable for military use.

   In FY 1977, approximately 72 percent of DOD export cargo (excluding ammunition and aircraft) was containerized.[273] All of this cargo was loaded at commercial port facilities because the DOD owns no general cargo container facilities. At all port locations thoughout the U.S., in FY 1978, the DOD shipped 7 million tons of cargo.[274] Since 1972, DOD has worked closely with MarAd to assure that sufficient port facilities are available for use during national emergencies for military resupply requirements. The DOD defines the port requirements and MarAd assigns the pre-designated berth.[275]

Historically, the commercial sector has provided transport services for sustained conflicts. If these assets were not available and responsive to the

DOD, the alternative would be to create a duplicate military system. This could be accomplished only at an enormous cost and would be vastly underutilized during peacetime.

The transport equipment owned by the DOD generally serves one of four objectives: (1) it is necessary for training military personnel; (2) it is equipment not available commercially; (3) it is required for use by tactical units; or (4) it is necessary to provide transportation services in the early stages of contingencies prior to mobilizing the commercial system. The DOD policy is that the Armed Services ". . . shall maintain and operate in peacetime sufficient DOD-owned transportation resource to meet emergency and wartime requirements with due regard for available commercial transportation."[276] Table 114 quantifies, by type, the DOD-owned assets utilized for intercity and international freight and passenger movements.[277] Not included are tactical trucks, aircraft, and ships that support the combat operation itself.

Virtually no DOD intercity movements are made using government-owned motor vehicles. The DOD-owned water and air terminals are kept to the minimum required to meet contingencies that cannot be readily met by the commercial sector. Water terminal facilities are designed to handle non-containerized cargo, autos owned by military personnel, and ammunition. The DOD owns and operates six general cargo ocean terminals to meet its specific needs and three ammunition outloading facilities. The bulk of cargo handling activities at the facilities is accomplished by commercial stevedoring companies. In addition to government-owned facilities, DOD maintains contract administration staffs at various contractor-operated locations which also process non-containerized cargo.

Federally Funded Vehicles and Services

NTPSC Policy Recommendations

The NTPSC recommends that the U.S. DOT and other Federal agencies should:

1. *Encourage individuals to use public or private transportation services already available;*
2. *Encourage state and local governments to assist individuals to provide their own service, and improve systems coordination;*
3. *Share responsibility with state and local agencies to encourage coordination and use of the private sector, or, when necessary, user-side subsidies, brokerage, and purchase of service agreements. If capital and operating assistance is available, private operators should be eligible to compete for it; and*
4. *Amend administrative guidelines and reporting requirements that hinder coordination and private participation, especially in the rural and urban markets.*

IMPACTS

Currently, Federal funding from the DOT and other agencies enables recipient agencies to take over private systems or establish specialized systems that may subsequently compete with private operators. For example, the number of privately owned urban transit systems decreased from 935 in 1970 to 614 in 1975, although the availability of Federal funds may not entirely explain this phenomenon.[278] Low fares or even free service by public and private non-profit systems are possible because of Federal assistance (e.g., UMTA's Sections 3, 5, 16(b)2, and 18[279] and CETA funding for drivers and dispatchers[280]).

Despite minimal legal barriers to coordinating transportation services and the existence of laws and

TABLE 114. Department of Defense vehicles, by type, 1978

Ships		Strategic Aircraft		Rail Cars	
Type	No.	Type	No.	Type	No.
Dry Cargo	6	C–5	70	General Purpose Tank Cars	1,451
Tankers	7	C–141	234	Special Purpose Tank Cars	310
Owned, but Chartered Tankers	9	Special Air Mission Aircraft	29	Flat Cars	310
Scientific Fleet	21	C–130	600	Boxcars	165
Fleet Support	22			Cabooses	6
				Guard Cars	5
Total	65	Total	933	Total	2,867

SOURCE: Department of Defense communication to NTPSC, February 1979.

agreements that seek to promote coordination, coordination has not been achieved.[281] One way to promote coordination might be a uniform billing and accounting system for grant recipients.[282] Another is subsidies to users, which might encourage use of private shared autos and privately-owned systems where these are least-cost alternatives. The TRIP program in West Virginia found that 79 percent of client coupons were used for taxis (a 10 to 15 percent increase in taxi trips), 21 percent for public transit, and less than 1 percent on intercity bus, Amtrak, Community Services Administration vehicles, and health vehicles.[283] A user-side subsidy demonstration in Danville, Illinois, resulted in a 50 percent increase in taxi trips.[284]

The administrative and operating costs for the Section 147 rural highway public transportation demonstration program's buses, vans, and taxi systems ranged from $0.21 to $0.37 per passenger-mile, from $0.63 to $0.76 per vehicle-mile, and from $9.19 to $12.49 per vehicle hour.[285] Using private automobiles at 20 cents per vehicle-mile could result in substantial savings.

Even user-side subsidy programs currently do not allow reimbursement to friends who provide transportation in personal autos or for maintenance or purchase of an auto; however, they do promote private operation, user choice, and efficiency.

Brokerage services, matching demand and supply, encourage cost-effectiveness by utilizing a mix of carpools, privately owned systems (e.g., school buses, taxis, intercity buses), and specialized transit systems. Two successful demonstrations have occurred in Knoxville, Tennessee, and Pittsburgh, Pennsylvania.[286]

Better coordination of funds for different transportation providers is intended to improve service or decrease costs, and the results of various demonstrations suggest it may be successful. For example, Iowa has increased transit ridership by 30 percent and decreased cost by 10 percent over a 2-year period. It established multi-county service areas and a single agency in each area to receive and allocate all Federal and state funds for passenger transportation.[287]

FINANCE, PRICING, AND TAXATION

INTRODUCTION

The NTPSC has recommended: the increased use of proper economic analysis to guide Federal spending and regulating; full user fees to be collected from those who generate costs; and the retention of modal trust funds. The shortages of revenues to meet the needs projected by the NTPSC are addressed in this section. In many cases, it is suggested that fee levels must be raised to offset the revenue shortfalls and to avoid reduced levels of service.

PROPER INVESTMENT ANALYSIS

NTPSC Policy Recommendations

The NTPSC has recommended that effective economic analysis be required for all major Federal transportation policies, programs, regulations, and projects.

Analysis should be based on a standardized format and established criteria and values determined by a review agency not directly responsible for implementing the subject of the analysis (such as GAO) or by a council of agencies at the Federal level.

The analysis of overall policies, programs, regulations, and projects in which there is a significant national interest should be conducted by the Federal agency primarily responsible for their implementation. The analysis of projects of a state or local nature for which Federal funds are to be applied should be conducted by the recipient agency of the Federal funding. The agency or council of agencies responsible for establishing the guidelines for common analytical procedures and criteria should review all Federal analyses and a sample of analyses performed at the state, local, and regional level. The review agency or council is to establish the types of economic analyses which are appropriate for different situations, taking into consideration the objective of the analysis and the ability to quantify major variables.

Transportation projects of a state or local nature, whether or not Federal funding is involved, should be prioritized using economic analysis. Where there are significant difficulties in quantifying benefits or costs, these should be clearly stated along with the selected economic indicators. Priority listings should be combined for a multimodal approach. For state and local transport projects, such analysis could provide the necessary information for evaluating Federal funding needs and allocation formulas and for guiding future revisions. The analysis could also be used to determine the use of Federal discretionary funds.

Impacts

Economic analysis encompasses numerous tools which can be applied in varying ways to meet different needs or answer different questions. To evaluate investments, it is necessary to isolate a specific application, design an appropriate program and then assess the potential impacts on selected transportation goals.

Economic analysis of government programs and projects initially began in the 1930s to evaluate water resource projects.[288] Its application spread to transportation and defense and today covers a variety of both physical and social investments. The standard indices or methods of appraisal have changed, and they now include net present value, internal rate of return, benefit-cost ratio, cost-effectiveness measures, plus variations of the above.[289]

Analysis can be applied for purposes such as:

1. Determining if a given regulation, program, or project is feasible from an economic perspective;
2. Determining which alternative among several is the more efficient in meeting a selected goal; and
3. Prioritizing the implementation of a series of feasible programs or projects, given overall resource limitations.

Many Federal regulations and programs are subjected to economic appraisals conducted by agencies such as the Government Accounting Office (GAO), the Congressional Budget Office (CBO), and the Office of Management and Budget (OMB). Other agencies more directly involved in the implementation of programs may also conduct appraisals. These analyses are often conducted at a very general level because of the lack of substantive project data.[290]

Federal investment in specific capital projects has also undergone economic analysis. The Federal Water Resources Council, composed of all agencies with duties related to water resource projects, prescribes the principles, standards and procedures to be used in economic appraisals of water and related land resource projects.[291] The U.S. Army Corps of Engineers, a member of the Water Resource Council, has conducted benefit-cost analyses of proposed navigation projects. DOT has required cost-effectiveness analyses in comparing alternative urban mass transportation projects, and recently proposed rules that would require a similar "alternatives" analysis for ". . . all prospective major urban transportation investments, whether they be highway or public transportation projects."[292] It should be noted though, that the act which established DOT in 1966 restricted the Secretary of Transportation from adopting "any investment standards or criteria" without prior congressional action.[293]

Economic analysis apparently has not been used to prioritize capital investments at the Federal level. There have been, however, priority listings of alternative programs for meeting a specific objective. For example, the 1976 National Highway Safety Needs Report[294] ranks countermeasures for reducing highway accident fatalities based on each program's cost-effectiveness.

Before defining the type of analysis which is to be implemented, it is important to assess the ways in which current policy and program development procedures are deficient and how economic methods can resolve such deficiencies.

If Federal policies have resulted in inefficient use of resources, what type of economic analysis would improve the situation without significantly distorting other Federal objectives? The most comprehensive study to test the projected gross level of investment in highways, using economic criteria, was the Highway User Investment Study. This study applied benefit-cost analysis to the highway needs reported by states for the 1972 National Highway Classification and Needs Study.[295] The results showed that while highway investments in urbanized and small urban areas have benefit-cost ratios of 4.0 and 1.9 respectively, rural projects have ratios of 0.4 and would fail standard feasibility tests.[296]

Further research by the NTPSC found that of the $329 billion (in 1975 dollars) needed for arterial and collector roads from 1975–1990 as reported by the states, only 42 percent (or $139 billion) could be justified using economic efficiency criteria. In urbanized areas, 86 percent of the state-reported needs would be built under an efficiency criterion and in rural and small urban areas only 7 percent of state-reported needs would be built. The difference is representative of the savings which would accrue by applying proper economic analysis to highway investment. Similar evidence of inefficiency would probably be found if this type of analysis were applied to investments for other modes.

From an economic perspective the investment model which would maximize the use of every dollar would be one in which each mode was subject to the same feasibility test and multimodal funding priorities were based on the return of each project's investment as it relates to total investment opportunities. This approach has not been adopted in traditional Federal, state, and local transportation budget planning. A different set of policy objectives has developed for each mode, explicitly or implicitly, resulting in the varied legislative and fiscal treatment of each mode that exists today.

Transportation regulatory programs do involve significant expense. One estimate is that transportation regulations cost the economy $183 million in administrative costs and $3,748 million in compliance costs in 1976. These transportation regulations accounted for 74 percent of all regulatory compliance costs to the economy.[297]

There have been encouraging developments recently in the application of economic analysis to setting government regulations. A Notice of Proposed Rule Making which appeared in the December 7, 1978 *Federal Register* provides for analysis of alternatives with regard to local and national goals and objectives in the social, economic, environmental, and energy fields. These are a continuation of joint planning regulations which FHWA and UMTA issued in September 1975.[298]

When projects are to be administered by FHWA it will be necessary to describe the:

1. Range of alternatives;
2. Evaluation methodology;
3. Estimation of costs and effects;
4. Travel forecasting procedures;
5. Citizen participation mechanisms; and
6. Level of detail of the analysis.

When UMTA has administrative responsibility the following principles are to be followed:

1. Long-range planning;
2. The policies of incremental development;
3. Evaluation of alternatives;
4. Transportation Systems Management; and
5. Public involvement in the planning process.

The inflationary impact of government regulations is often cited. Not all costly regulations are inflationary, however. The reason for quantifying costs of government regulations is not to exclude them because they are costly, but to try to compare these costs with their benefits. If the benefits are greater than the costs, then even if benefits are not reflected in monetized GNP, the welfare of the U.S. economy has been improved. The result is desirable even if inflation has been "caused" in the commonly used price indices. The explanatory OMB Circular A–107, issued on January 28, 1975, required an Inflationary Impact Statement (IIS) on any regulation exceeding $100 million in cost to the economy.[299] In December 1976, President Ford issued Executive Order 11949 extending the program and changing the name of the required document to an Economic Impact Statement.[300]

As of March 1979, 105 Economic Impact Statements had been filed. Some agencies (notably the EPA and the DOT) devoted substantial resources to their efforts, while others did not.[301] Analysts suggest that reasonably good estimates of costs were obtained in these statements, but estimates of benefits were weak and alternatives were often ignored. Design of less costly countermeasures or ways of achieving the same purpose are often the major results of systematic analysis. The analysts, who surveyed Inflationary Impact Statements at the Council on Wage and Price Stability, concluded that a major effect of the program was to strengthen the hand of economists and policy analysts in the agencies.[302]

In March 1978, President Carter issued Executive Order 12044 to improve government regulations, requiring:[303]

1. A semi-annual agenda of regulations;
2. An opportunity for public participation in the process; and
3. Regulatory analysis.

As with previous executive orders, it applied to agencies of the executive branch only. The NTPSC recommends that all Federal agencies be required to perform such analyses.

EXPENDITURES, USER FEES, AND TRUST FUNDS

Airports and Airways

NTPSC Policy Recommendations

The NTPSC has proposed that the Airport and Airway Trust Fund be maintained as established in the Airport and Airway Development Act of 1970 (Pub. L. 91–258) and subsequent amendments. All current distribution formulas, matching grant formulas, eligibility criteria, revenue sources, and tax rates would remain unchanged. The level of appropriations for eligible projects may vary based on the needs of those types of projects. (Throughout this section, the term "Trust Fund" is used to refer to the revenue collection and expenditure associated with Federal airport and airways programs, as well as the accounting device of the trust fund itself.)

EXISTING PROGRAM

The Trust Fund was established by the Airport and Airway Development Act of 1970 to provide the necessary funding for a ". . . substantial expansion and improvement of the airport and airway system to meet the demands of interstate commerce, the postal service, and the national defense."[304]

IMPACTS

Adequate Service

The principal stated objective of the Airport and Airway Development Act of 1970 was to provide an airport and airway system which will be adequate ". . . to meet the current and projected growth in aviation."[305] Based on the Trust Fund revenue and expenditure projections presented in earlier chapters, maintaining the Trust Fund should ensure adequate capital for future growth.

Appropriate Rates/Prices

By maintaining the Airport and Airway Trust Fund without altering taxation rates or the prohibition against applying user tax revenues to most FAA O&M expenditures, users are paying a subsidized rate for airport and airway facilities. About 70 percent of all Federal aviation expenditures, including expenditures for operating and maintaining the airway system, are supported from general revenues.

If trust funds were used for Federal airways O&M costs, current tax rates would not supply sufficient revenues if all capital needs were met. User taxes would have to more than double to generate the over $2 billion (in constant 1975 dollars) annually required for O&M by 1985.

Among the various airport user categories, the level of subsidy varies such that some users are paying more of their share of the costs than others. In its original cost allocation study (1973), the DOT found that both air carrier and general aviation operators paid less than their full share of aviation costs, with general aviation paying a smaller proportion of allocated costs than air carriers.[306] In an update of the study,[307] the DOT generally came to the same conclusion.

The latest study allocates costs by user category in two ways. The first method simply allocates all airport and airway costs to users. The second method holds users responsible only for "the cost of the minimum service they require."[308] This latter method is in response to general aviation operators' criticisms of the 1973 study that the quality and sophistication of the FAA services "are frequently oriented toward the performance requirements of air carrier and military aircraft" and "may exceed the requirements of general aviation alone."[309] Thus, the second method attempts to determine the actual costs imposed by each user type.

Using the latter method results in the distribution of all Federal airport and airway system costs shown in Table 115.[310]

The DOT study, however, reveals that while air carrier operators will pay an increasing share of their costs, general aviation users will pay a declining share of their costs. As of FY 1978, while air carrier operators contributed 88 percent of allocated costs, general aviation users contributed only 25 percent. By 1987, the percent of costs recovered from air carriers will rise to 103 percent, while revenues from general aviation will only recover 21 percent of allocated costs.[311] In future years, then, air carrier revenues will be cross-subsidizing general aviation.

TABLE 115. **Distribution of Federal airport and airway system costs, FY 1978 and FY 1987**

	FY 1978	FY 1987
General Aviation	13%	14%
Air Carriers	50%	48%
Military and Government Aviation	10%	9%
Public and Other	27%	29%
Total	100%	100%

The disparity in cost recovery is due to two factors. First, general aviation activity is expected to grow at a faster rate than air carrier activity. FAA projections suggest that air carrier operations are expected to increase by 2.1 percent annually from 1975 to 1990, while general aviation operations are to increase by 3.7 percent annually. Thus, where costs are related to aviation activity levels, general aviation costs should rise faster than air carrier costs.

With respect to certain types of airway activities, a general aviation flight operation is more costly than a typical air carrier operation. Costs of enroute air traffic control requirements are related inversely to the average speed for a class of aircraft. The slower the aircraft, the more costly will be the enroute air traffic control due to the longer time spent in a control region. One concern has been that such a relationship ignores the "intensity" of control, which is greater for faster aircraft due to the speed with which they close in on one another.[312]

The second factor in the disparity is that general aviation user taxes are flat fees and not ad valorem taxes. The main user fee receipts from general aviation are the fuel tax (7¢ a gallon) and the aircraft registration fee ($25 per aircraft). Registration tax receipts cannot keep up with projected inflation and will decline in real terms. The aviation fuel tax receipts (in constant dollars) should grow at an annual rate of 3.4 percent, according to NTPSC forecasts, which just matches the increase in general aviation activity without raising its share of cost recovery.

According to NTPSC revenue and expenditure forecasts, by 1985 Trust Fund revenues could cover 67 percent of air carrier and general aviation costs, requiring $700 million (in constant 1975 dollars) from general funds. By the year 2000, revenues could cover 89 percent of allocated air carrier and general aviation costs, with $350 million (in constant 1975 dollars) required from general funds. The increase in the proportion covered by Trust Fund revenues is due to tax receipts growing while capital investment needs remain constant. *Also, it is assumed that Trust Fund revenues can be used for airway O&M costs.* If not, the amount of general revenues needed would be much greater.

No studies have been made of the costs imposed by international air carrier passenger and freight traffic. It is evident, however, that Trust Fund receipts in constant dollars from the enplanement tax will only keep pace with inflation so that while international travel increases in the future, tax receipts (which in 1975 totalled $55 million) will not be more than $59 million in the year 2000 (in 1975 constant dollars). Further, international air cargo does not contribute revenues directly to the Trust Fund.

Economic Efficiency

In assessing the effect of the Trust Fund on the allocation of resources, it is helpful to begin with the potential theoretical effects and then observe some of the actual results since the Fund was established in 1970. The most direct method for the proper allocation of resources is a pricing scheme through which users pay for the costs they impose on the system. This also carries with it the assumption that the revenues will be directed towards the allocated costs. Under a situation of no congestion, the price will "consist only of direct costs, i.e., of the value of the resources directly consumed as a result of the provision of the good or service in question." Where congestion is significant, an additional charge or "rent" would be included in the price which will lead to the proper allocation of limited capacity.[313]

Airport and airway pricing practices have continuously been criticized for not applying standards of efficient pricing.[314] Much of the criticism has centered on the lack of proper landing fees which would better allocate aircraft operations among peak and off-peak hours and which could lessen the need for additional physical capacity.

The fees that comprise the bulk of Trust Fund revenue sources are related to the level of aviation use: passenger ticket tax receipts rise with increases in passenger-miles traveled, waybill tax receipts rise with increases in ton-miles traveled, and returns from the general aviation fuel tax rise with the hours flown. Although overall aviation activity may affect the level of these charges, they do not qualify as "efficient" user prices because they are not related to specific cost components of the airport and airway system which are financed through the Trust Fund and, thus, do not help to properly allocate demand.

The 1978 DOT study on cost allocation provides the following example of the effect of current user taxes in terms of economic efficiency:

> While fuel taxes are indirectly linked to the use and unit cost of service, this relationship does not, however, necessarily promote efficient resource allocation. Fuel taxes do not provide an automatic procedure by which FAA resources are channeled into providing aviation services which are considered a fair value by general aviation.[315]

There are, however, practical obstacles to the implementation of more direct facility taxes. For example, imposing specific terminal charges at airports with FAA towers could cause significant diversion of traffic to nontowered airports, which might increase general aviation accidents. Imposing specific enroute service charges could reduce safety by diverting flights from IFR to VFR service.[316] For these reasons, objectives other than economic efficiency also must be considered in setting user taxes.

The manner in which funds are allocated also affects the efficiency of the airport and airway system. Large hub air carrier airports receive 33 percent of air carrier entitlement funds and contribute more than that portion to the Trust Fund. However, their "needs", according to the NASP, represent 20 percent of air carrier airport needs. Air carrier airports receive 86 percent of total funds (and contribute a similar proportion), while general aviation airports receive 14 percent. However, the NASP estimates "needs" to be split 60 percent for air carrier and 40 percent for general aviation facilities.[317] In the end what occurs is not only a subsidy from general revenues to airport users but also a cross-subsidy from one type of user to another, from one region to another region, and possibly from one type of airport to another. The tax rates do not reflect the needs of each type of user and the allocation formulas reflect neither the contributions nor the needs of each type of user.

The last Trust Fund element which affects economic efficiency is the prohibition against applying user receipts to pay for most Federal airway O&M costs. Thus there is a constant guaranteed source for capital expenditures, but operating expenditures must rely on yearly appropriations.

Theoretically all of the above could distort the allocation of resources for aviation by:

1. Stimulating capital investments where no needs exist just because the funding is available;
2. Stimulating capital-intensive solutions to capacity problems because funding restrictions impede development of less costly operational or pricing solutions;
3. Stimulating general aviation operations due to the underpricing of general aviation facilities.

It is difficult to evaluate these three types of distortions because the program is relatively new, considering that major changes were made in funding, eligibility criteria, and matching ratios in 1976. Some tendencies, however, are apparent. Analyses show that the Trust Fund has not stimulated unneeded capital investment in new airports. The number of publicly-owned airports grew from 1967–1970 by 4 percent annually. From 1971–1975 the rate was 1 percent per year.[318] However, no estimate has been made of the rate of improvements to existing facilities before and after 1970, which might more clearly reflect the effects of ADAP funding.

Another evaluation is to compare the distribution of funding between regions and types of facilities in the event a more direct "needs" approach or economic analysis was instituted rather than the present formulas. In highway funding such a comparison by the NTPSC revealed significant differences suggesting that distribution formulas typically lead to the funding of projects which under economic criteria would be considered an inefficient use of resources.

Despite the lack of economic analyses, many factors have controlled or inhibited airport investment, minimizing the potential misallocation of resources. The FAA's National Airport System Plan limits the number of eligible facilities, and the FAA reviews projects prior to funding. Other reasons for the limited use of ADAP funding are:

1. Prior to 1976, the Federal share of project costs was lower (at 50 percent), making local matching fund requirements more difficult. Currently non-terminal-related projects receive a 75 to 80 percent Federal share which may stimulate more investment;
2. Prior to 1976, with Federal standards and requirements being higher than those of most states, some general aviation sponsors found that airports could be constructed privately "faster and at lower costs than the Federal program" without "an appreciable difference in quality."[319] The 1976 amendments attempted to correct this situation; and
3. Externalities may be inhibiting airport development due to environmental challenges and the scarcity of suitable land.

It is possible the Trust Fund encourages capital-intensive solutions to problems which could be solved by less costly operational and pricing procedures. For example, it is likely that landing fees, if applied properly in the peak hours, would result in diverting a portion of general aviation operations to off-peak hours. The result would relieve some congestion and lower the capital requirements for additional capacity.[320] The Port of New York Authority found that in 1968, by raising the minimum landing and takeoff fee for small aircraft from $5 to $25 in the peak hours, general aviation activity declined by 30 percent during those hours in August and September as compared with activity levels in July when fees were not applied.[321] By offering capital for airport improvements at generous terms, the Trust Fund is removing an incentive which might lead to more use of peak-period pricing by airport operators and is thus promoting capital-intensive solutions.

Similarly, because Trust Fund revenues are to be utilized primarily for airway capital facilities rather than O&M, the FAA is encouraged to implement capital-intensive rather than labor-intensive operating policies. The FAA budget projections assume increasing labor productivity through the use of more sophisticated traffic control technology.[322] In theory this could be economically more efficient than current practice if such productivity gains are achieved. One study, however, found that the current mix of capital and labor at enroute and terminal air traffic control centers is "biased strongly in favor of capital" and that a more efficient mixture would tend to be more labor-intensive.[323]

As for stimulating more aviation activity than would otherwise occur under efficient pricing, the heavily subsidized price for general aviation users has apparently not resulted in much more activity than would occur under prices that would recover a higher proportion of costs. The DOT in *Trends and Choices* estimated the growth rates which would result under various higher-price schemes and predicted that from 1975 to 1990 a large increase in general aviation activity would still materialize.[324]

In summary, it is evident that the tax structure and distribution policy of the Airport and Airway Trust Fund do not promote economic efficiency. Although no significant impacts have been identified so far, changes in the 1976 amendments could lead to improper investments in future years, encouraging capital application rather than less costly operational and pricing solutions to capacity problems.

Environmental Protection and Enhancement

Because aviation activity is not expected to vary at different levels of cost recovery, no significant impact on the environment should result from maintaining the Trust Fund. The Trust Fund can have a positive effect on environmental planning. In the FAA's Aviation Noise Abatement Policy (November 1976), for example, project sponsors must take action to ensure that land use in the vicinity of the airport is compatible with aircraft operations before a project is approved.[325]

Safety

Accident and fatality rates in all aviation user categories had declined steadily prior to the establishment of the Trust Fund,[326] so it is impossible to ascertain the exact contribution to that decline which can be attributed to the Trust Fund.

The reduction in fatality and accident rates has been considered the result of improved air traffic control, pilot training, navigational and landing aids, and a gradual shift to more reliable aircraft. Thus, even while aviation activity has increased, safety levels have been maintained or improved.[327] Where the Trust Fund has directed funding to facilities and equipment, it has enhanced safety.

Another way in which the present Trust Fund promotes safety is through its user tax structure. Because taxes are not directly related to the use of safety facilities and equipment, aircraft operators have an incentive to use these facilities. The FAA has rejected the idea of imposing enroute service fees and terminal charges at airports with FAA towers because fees could divert general aviation from using services, thereby increasing accidents.[328]

Regional and Urban Development

The impact of airports on regional development will depend on the interaction of several factors which will vary from place to place and by type of facility. The Airport Planning Grant Program (PGP), which provides Trust Fund revenues for airport master planning and system planning, promotes the integration of airport development with the overall development needs of states, regions, and metropolitan areas.[329]

Equity

The user tax structure of the Trust Fund is inequitable in that general aviation users are subsidized relative to other aviation users. This disparity will widen in the future due to the flat fees that general aviation users pay. Inequity of the system is not confined to the unequal treatment of the users but also affects the general population. Subsidies are being provided from the general fund to aviation users who are generally "higher income" as compared with the income distribution of the population at large. Table 116 illustrates this point, showing income distributions for general aviation aircraft owners from three surveys taken in the 1960s. Also it has been found that almost three-fourths of general aviation flying is for business purposes.[330] The subsidies thus represent a regressive form of income redistribution.

TABLE 116. Percent distribution of aircraft owners by income class, three surveys, 1963, 1967, and 1968; and total and disposable family income, 1966

	Survey[a]			U.S. Family Income	
Income Class (dollars) per year	TIME (1963) (1)	Cessna (1967) (2)	Aircraft Owners and Pilots Association (1968) (3)	Total Money Income (1966) (4)	Disposable Income (1966) (5)
Less than 10,000 ..	15	14	19	70	80
10,000–14,999......	15	24	23	21	14
15,000–24,999......	29	31	29	8	
25,000–49,999......	23	23	20		6
50,000 and over ...	18	8	9	1	
Total	100	100	100	100	100

SOURCE: From Jeremy J. Warford, *Public Policy Toward General Aviation,* Washington, D.C.: The Brookings Institution, 1971, p. 101.

[a]Respondents who did not answer the question on family income are prorated among the income classes.

Urban Transit Trust Fund Study

NTPSC Policy Recommendations

The NTPSC recommends that a Federal urban transit trust fund be studied. A fixed contribution from general revenues, apportioned by the appropriate formulas, might be considered.

The above policy statement calls for *study* of an urban transit trust fund. For this reason, the following discussion will focus less on the impacts of implementing a trust fund and more on the questions which surround its implementation. Implicit in the concept of an urban transit trust fund is the assumption that other modal trust funds will continue in their present states; if these were discontinued, other approaches to financing transit, such as multimodal block grants, provide state and local governments with greater planning flexibility and administrative efficiency.

RATIONALE

Urban mass transportation relies heavily on public funds. Taxpayers who live in rural areas not served by mass transit, and those who have transit available but prefer to use other means of transportation may complain that they should not have to subsidize mass transit users. Over the past two decades, providing mass transit service has become increasingly expensive while fares have remained relatively low. Fares rarely cover system maintenance and operation costs; capital improvements and acquisition of new equipment are often financed from public treasuries.

The concept of a transit trust fund is favored by many proponents of urban mass transportation as providing a continuous source of funding, and allowing state and local governments to anticipate and fund long-range capital projects. Besides paying for capital improvements and equipment, a transit trust fund might also be used to help defray maintenance and operation costs.

Unlike the airport and highway trust funds, and even the newly established waterways trust fund, the urban transit fund would be financed at least partially with money collected from taxes other than user fees. The reasons for this have been detailed elsewhere by the NTPSC.[331] Because they believe transit is providing social and environmental benefits, public transit operators, who today are frequently local governments, are willing to charge less than the actual cost of operating such a system. Briefly, these benefits include the reduction of air pollution and traffic congestion in urbanized areas, and the provision of transportation to members of society who would otherwise lack mobility.[332] Because of these general benefits, the argument goes, mass transit should be subsidized by non-users as well. Opponents reject that notion, arguing that such subsidies do not provide incentives for efficient operation, and therefore do not provide service as beneficial as could be the case with more efficient use of scarce resources.

Transit fares have not kept pace with the costs of providing services. One source indicates that:

> While total operating costs increased by 165 percent from 1967 to 1977, operating revenues increased by only 47 percent. The slower growth of revenues, one-fourth the rate of increasing costs, resulted from a combination of net declines of 13.3 percent in patronage since 1967 and only modest increases in average fares.[333]

This source concludes that not only have fares "not kept pace with inflation," but in 1972 constant dollars, they actually declined by 12 percent.[334] Table 117 shows recent shortfalls between operating costs and revenues.

Table 117 shows that since 1970 revenues have not covered operating expenses. In recent years the gap has widened. If the trend continues, there will be a significant shortfall of funds by the year 2000. NTPSC forecasts presented in Chapters 10 and 11 support this belief.

An urban transit trust fund would have to cover a portion of the costs of capital improvements, estimated by the NTPSC to total $161.6 billion (in 1975 dollars) to the year 2000, as well as a share of the operating and maintenance expenditures for such a system, which could be as high as $120 billion to the year 2000.

FUNDING OPTIONS

A study of an urban transit trust fund must consider alternative funding sources to determine whether or not a modal trust fund is the best way to meet transit needs. It should include alternative pricing schemes for users as well as alternative taxing schemes whereby money can be collected to finance the trust fund.

TABLE 117. Urban transit operating revenues and expenses, 1970 to 1977 (millions of current $)

Year	Revenues	Expenses	Deficit
1970	$ 1,707	$ 1,996	$ 189
1971	1,741	2,152	411
1972	1,729	2,242	513
1973	1,798	2,536	738
1974	1,940	3,239	1,299
1975	2,002	3,706	1,704
1976	2,161	4,021	1,860
1977	2,280	4,305	2,025

SOURCE: American Public Transit Association, *APTA Transit Face Book 1978*, Washington, D.C.: 1978, pp. 20–21.

Congress has considered the establishment of an urban transportation trust fund.[335] Former Secretary of Transportation John Volpe proposed a "Single Urban Fund" to be financed through a $1 billion per year contribution from the Highway Trust fund for "investment in local projects." His proposal included yearly increases in such a fund and an allocation scheme based on the population in the SMSAs.[336] This differed somewhat from the common notion of an urban transit trust fund by including money for both highways and transit to be spent according to the individual needs of localities. In 1977, Representative James Howard proposed that a transportation trust fund to include urban transit be financed from a Federal corporate profits tax. In 1979, both Secretary of Transportation Adams and President Carter proposed variations of urban transit trust funds.[337]

In light of present funding problems, both for long-range capital and short-term operation costs, there is justification for again considering an urban transit trust fund. According to one source:

> The Congressional Budget Act of 1974 has had a significant impact on UMTA funding. First, new Interstate transfers must go through the appropriations process, thus closing a previous back door. Second, multi-year funding such as UMTA has received in the past is now more difficult to obtain, although not impossible. Specifically, new legislation granting contract authority comparable to UMTA's past funding is no longer effective without an accompanying appropriation (Section 401 of the Budget Act).[338]

An urban transit trust fund financed from some specific tax rather than general revenues could provide a way around this dilemma, but it has pitfalls of its own. Specifically, long-term assurance of a steady funding source, such as is offered by the trust fund concept, can lead to almost uncontrollable spending in future years.[339] Thus, while this form of funding may give "the greatest assurance to states and localities of funds for each mode,"[340] it gives Congress less control, it makes multimodal policymaking more difficult, and it could lock modes into particular funding sources.[341]

Highway Finance

NTPSC Policy Recommendations

The NTPSC recommends a continuation of categorical programs of Federal aid for highways, with greater flexibility within and between categories. These programs would be partially financed by the Federal government through proper user fees, accounted for in the Highway Trust Fund, and spent following proper investment analysis. However, Fed-

eral aid for highways also would continue to be financed from sources other than user charges feeding the Highway Trust Fund. Certain Federal expenditures for which the direct beneficiaries cannot be identified and taxed could be financed from general tax revenues.

In special cases, tolls for new and improved highway facilities, bridges, and limited use facilities should be applied as a financing mechanism and to permit a smoother flow of traffic. Highway maintenance would remain the responsibility of state and local governments.

Impact Evaluation Assumptions

In order to estimate the impacts of the foregoing policies, the NTPSC made the following additional assumptions:

1. Federal user charges will be held at the same rates as at present.
2. Federal highway receipts from other than user charge imposts will increase in accord with projections of the 1965 through 1976 constant dollar trend.
3. All other revenues will be raised by state and local governments. Table 118 assumes state and local governments increase revenues at the same general rate they have for the past decade. As an alternative, Table 120 shows the additional amounts state and local governments would have to raise to conform to the recommended Federal policies while maintaining the present highway conditions and performance levels.
4. The Federal government will allow state and local governments to collect tolls on Federal-aid highways meeting the aforementioned "special conditions."

TABLE 118. **Forecast highway revenues by level of government, medium-growth scenario, 1975 to 2000 (billions of 1975 $)**

	Federal		State and Local		Total[a]
	User Impost[a]	Non-User Sources[b]	User Impost[a]	Other[c]	
1975....	5.7	2.0	12.7	7.6	28.0
1985....	5.0	3.2	13.4	8.1	29.7
2000....	3.3	4.5	13.4	10.5	31.7

SOURCE: NTPSC forecasts.

[a] See Table 42.

[b] Linear projection of 1965 through 1976 trend based on data in FHWA's *Highway Statistics Summary to 1975.*

[c] Residual amount necessary to achieve the total revenue forecast.

Table 119 shows the NTPSC forecast Federal-aid revenues assumed in both constant 1975 and current dollars (assuming 5 percent annual inflation under the medium-growth scenario).

In constant dollars, the year-2000 level of Federal disbursements would be about $60 million more than in 1975 (an increase of less than 1 percent). In the same period traffic is expected to grow 86 percent and by the year 2000 more than 57 percent of Federal highway revenues are expected to derive from sources other than highway user charges compared to 26 percent in 1975.

From Table 119 it can be seen that Federal highway revenues (from both users and other sources) are expected to increase in current dollar terms through the year 2000. This growth provides an opportunity for improved allocation of resources, that is, resources devoted to projects having higher benefit-to-cost ratios. Federal funds for rural primary and secondary roads could be maintained at current levels of funding, and each state could be given its historical level of funds for these roads. Concurrently, the growth in current dollar revenues could be allocated to provide increased capacity in urbanized areas or on congested rural interstate links.

Table 120 contains figures illustrating the implications of the NTPSC's recommended policy, assuming a future level of nationwide disbursements adequate to maintain 1975 highway condition and performance levels. State and local government disbursements would have to more than triple compared to 1975 levels. The Federal contribution to nationwide annual highway expenditures would decrease from the 1975 level of 27 percent to 16 percent by 1985 and 10 percent in the year 2000.

The Federal government might encourage the states to increase their contributions by decreasing the statutory Federal matching share to increase the leverage of the decreasing Federal funds.

IMPACTS

The impacts of the policies depend heavily on what state and local governments would do given the Federal policy. They can either increase funding to maintain reasonable levels of highway condition and performance within their jurisdiction, or they can fail to do so, letting highway conditions and performance levels decline as traffic grows.

Adequate Service

If no action is taken at the Federal level to increase Federal aid to highways, then the burden of maintaining or improving highways will increasingly become the responsibility of state and local governments. A continued decline in service levels could mean increasing traffic congestion with the related ills of air pollution, energy waste, increased travel times, and lower productivity for business and commercial

TABLE 119. Forecast of Federal highway revenues, medium-growth scenario, 1975 to 2000 (billions of $)

	Constant 1975 $[a]			Current $[b]		
	User	Non-User	Total	User	Non-User	Total
1975	5.7	2.0	7.7	5.7	2.0	7.7
1985	5.0	3.2	8.2	9.1	3.3	12.4
2000	3.3	4.5	7.8	11.2	15.2	26.4

SOURCE: NTPSC forecasts.

[a] See Table 118.

[b] Computed assuming 5 percent inflation per year.

transportation. If congestion became severe, it might cause changes in the amount of travel and traffic patterns.

The U.S. Department of Transportation has estimated that the condition of arterial and collector highways declined and that travel per lane-mile increased between 1970 and 1975.[342] During the period, average national disbursements per VMT decreased (from all levels of government). These statistics tend to indicate that, other things being equal, the level of disbursements may have been less than adequate to maintain the nation's highway condition and service levels.

The U.S. Department of Transportation estimated the costs to maintain the same general level of condition and performance on arterial and collector highways through the year 1990. These estimates are shown, along with several alternatives, in Figure 33. The figure gives additional evidence that the 1975 level of disbursement per VMT may be inadequate to maintain the current highway condition and performance into the future with increasing traffic.

Figure 33 also illustrates the NTPSC forecasts of highway revenues if present Federal practices and the historical trends in state and local funding are continued. As shown, the forecast revenues increasingly fall short of being able to finance total expenditures. The lowest level expenditure shown is the constant disbursement per VMT curve. This level of expenditure represents a continuing decline of highway conditions and performance through the year 2000. The NTPSC forecasts based on the highest level of highway investment (top curve, Figure 33) indicate positive benefits exceeding costs at that level of investment. Thus, failure to invest in adequate highways would mean a greater cost to the public than the investment dollars saved. These costs would be in the form of increased operating costs, delays, air pollution, and energy consumption.

TABLE 120. Disbursements by governments in accord with NTPSC policy, maintaining current highway condition and performance levels, medium-growth scenario, 1975, 1985 and 2000 (millions of 1975 $)

	1975	1985	2000
Required Disbursements	28,153	50,250	70,980
Federal Disbursements	7,741	8,200	7,800
Remainder for State and Local Governments	20,412	42,050	63,180

The congestion will be concentrated in larger urbanized areas, which have the greatest present congestion on arterial and collector highways, as well as the greatest forecast growth in travel. In 1977, the U.S. DOT forecast that 53 percent of the Interstate mileage in urban areas will have traffic exceeding its design capacity by 1990 (see Figure 34).

In addition to widespread congestion in urbanized areas, selected Interstate Highway segments in rural areas are likely to become increasingly congested. These segments are concentrated largely in a few of the more densely populated and industrialized states. Increasing congestion on some of these segments might increase the costs or decrease the performance of interstate trucking as well as passenger travel.[343] In 1977, the DOT forecast that by 1990, 28 percent of the rural Interstate mileage will experience traffic demand exceeding its design volume. (See Figure 35).

If the states and localities with increasing congestion act swiftly to alleviate it, much of the above loss might be averted. However, even at the highest level of highway development shown in Figure 33, and with a very high level of investment in urban mass transportation as well, the NTPSC simulations indicate most urbanized areas are likely to experience decreased travel speeds on arterial and collector highways.[344]

Appropriate Rates and Prices

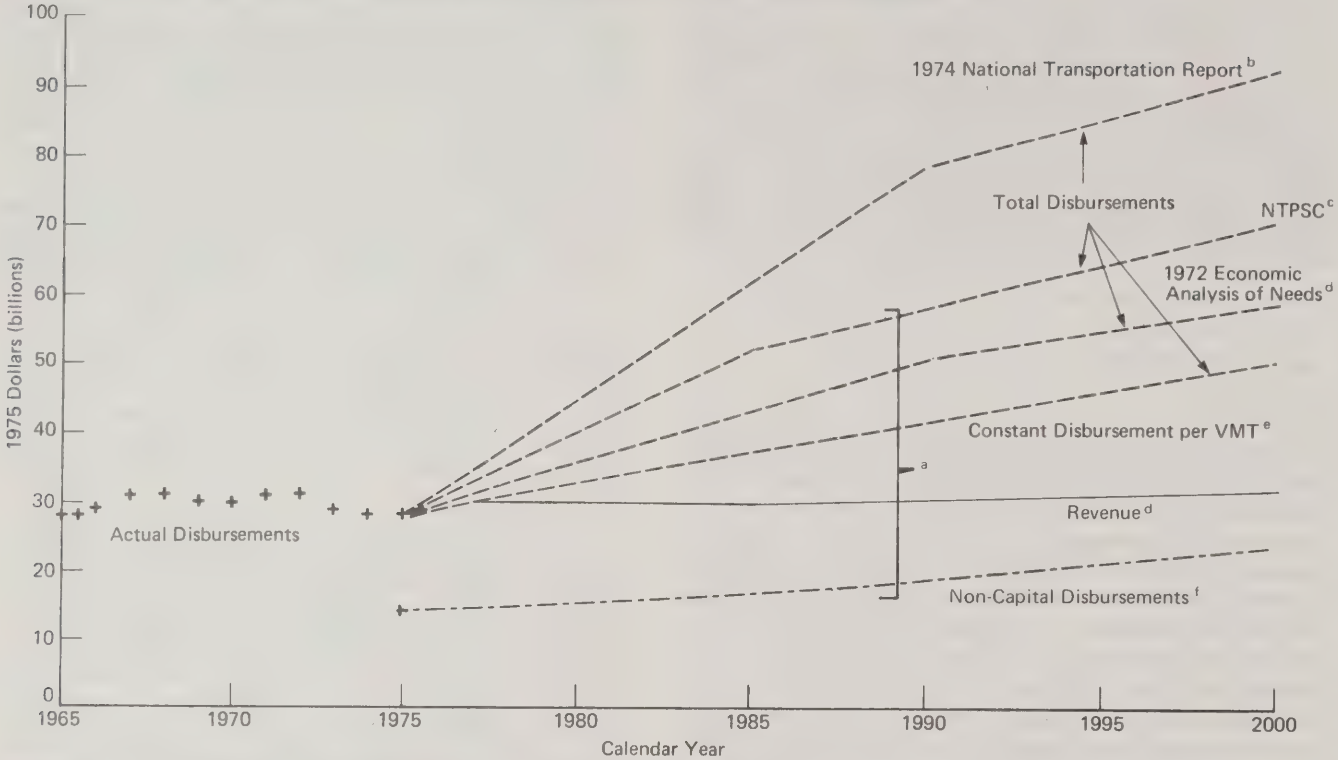
If the Federal contribution to highways in constant dollar terms declines as a result of continuing current practices, the significance of state donor-recipient conditions resulting from allocations of the Federal Highway Trust Fund should diminish. Too, individual state and local governments may increasingly tailor their highway revenue and disbursement patterns to local conditions. Both the above changes appear to promote more appropriate pricing of highways.[345]

Maritime Aids

NTPSC Policy Recommendations

The NTPSC recommends that existing Federal financial aids to the maritime sector be continued, but with modifications that stress the efficient utilization

FIGURE 33. Comparison of forecast revenues and alternative levels of highway disbursements.



SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics, Summary to 1975,* Washington, D.C.: 1977. The NTPSC converted the current dollar values reported to constant 1975 dollars using Federal Highway Administration price indices (same source).

[a] The difference between the non-capital and total disbursements is capital investment.

[b] See Chapter 10, particularly Table 40 for capital investment levels.

[c] See Chapter 10, Table 39 for capital investment summary.

[d] See Chapter 10, Figure 31 and Table 42 for greater detail.

[e] Computed using 1975 disbursement per VMT and NTPSC forecasts of total VMT.

[f] Non-capital disbursements computed using state estimates for the *1974 National Transportation Report*. Interest payments estimated by NTPSC and were added to the state figures.

of the existing fleet and the needs of national defense. In addition, the U.S. should pursue, through multilateral negotiations, reduction in such aids as loan guarantees, loans and grants, so that the free market can operate.

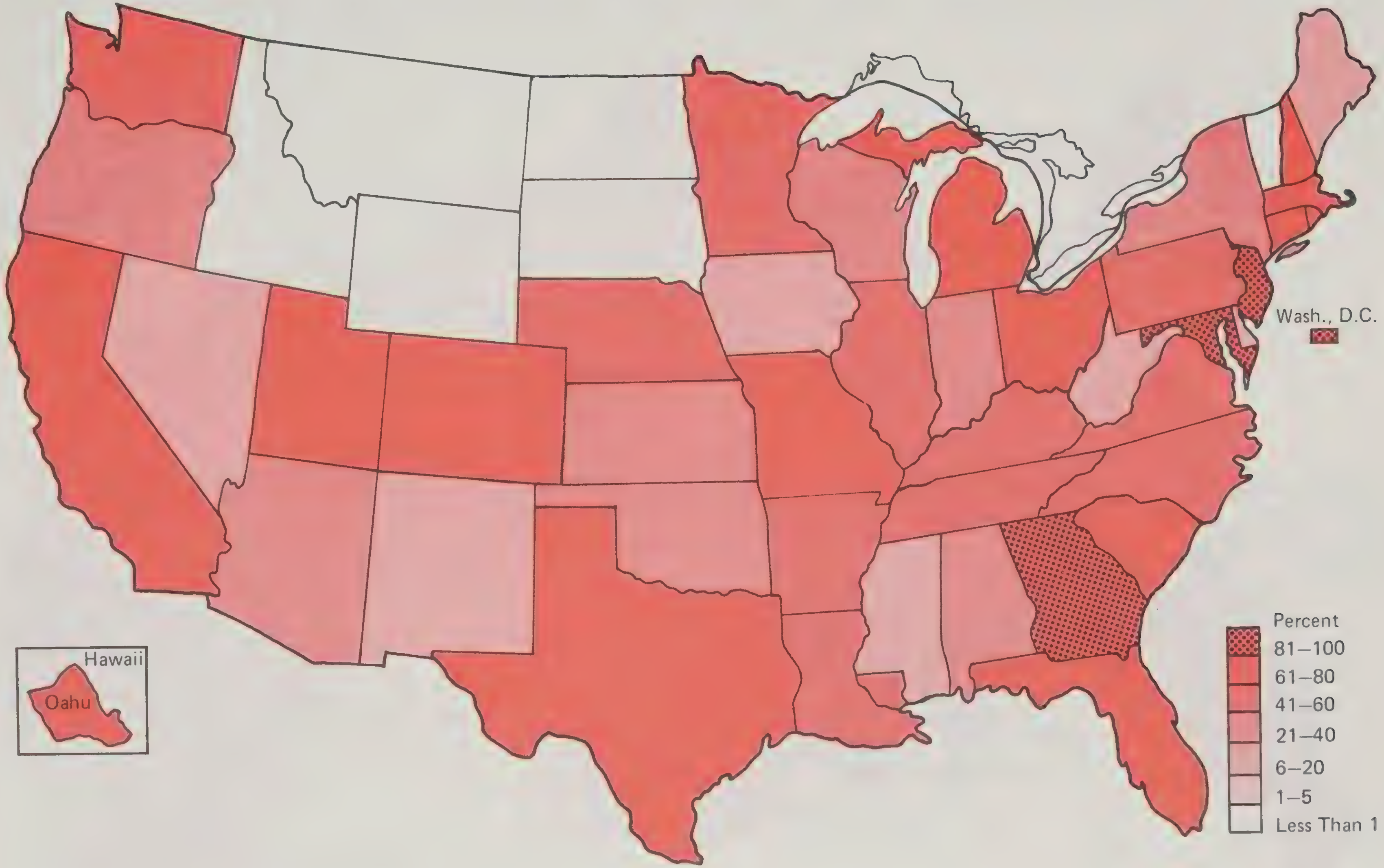
IMPACTS OF RETAINING EXISTING POLICIES

The U.S. maritime capability consists of the U.S. subsidized fleet, U.S. non-subsidized flag vessels, the "effective U.S. control" fleet and other U.S.-owned foreign-flag ships. Within the U.S.-flag categories, two sectors of the industry operate in different economic environments: the liner (or common carrier) segment; and the bulk (dry or liquid) segment. Liner-type vessels, including break-bulk and container ships, make up about 53 percent of the U.S.-flag fleet, and are the primary contributors to U.S. national defense requirements. They consist of a few combination passenger and cargo ships, freighters, and full container ships.[346]

Most U.S.-flag liner vessels in international trade are subsidized, justified by national defense requirements. These requirements, which are determined by the military services, represent shipping needs for direct support of U.S. forces in time of war or national emergency. National security, the capability to import critical raw materials during a national emergency, is also a maritime goal.

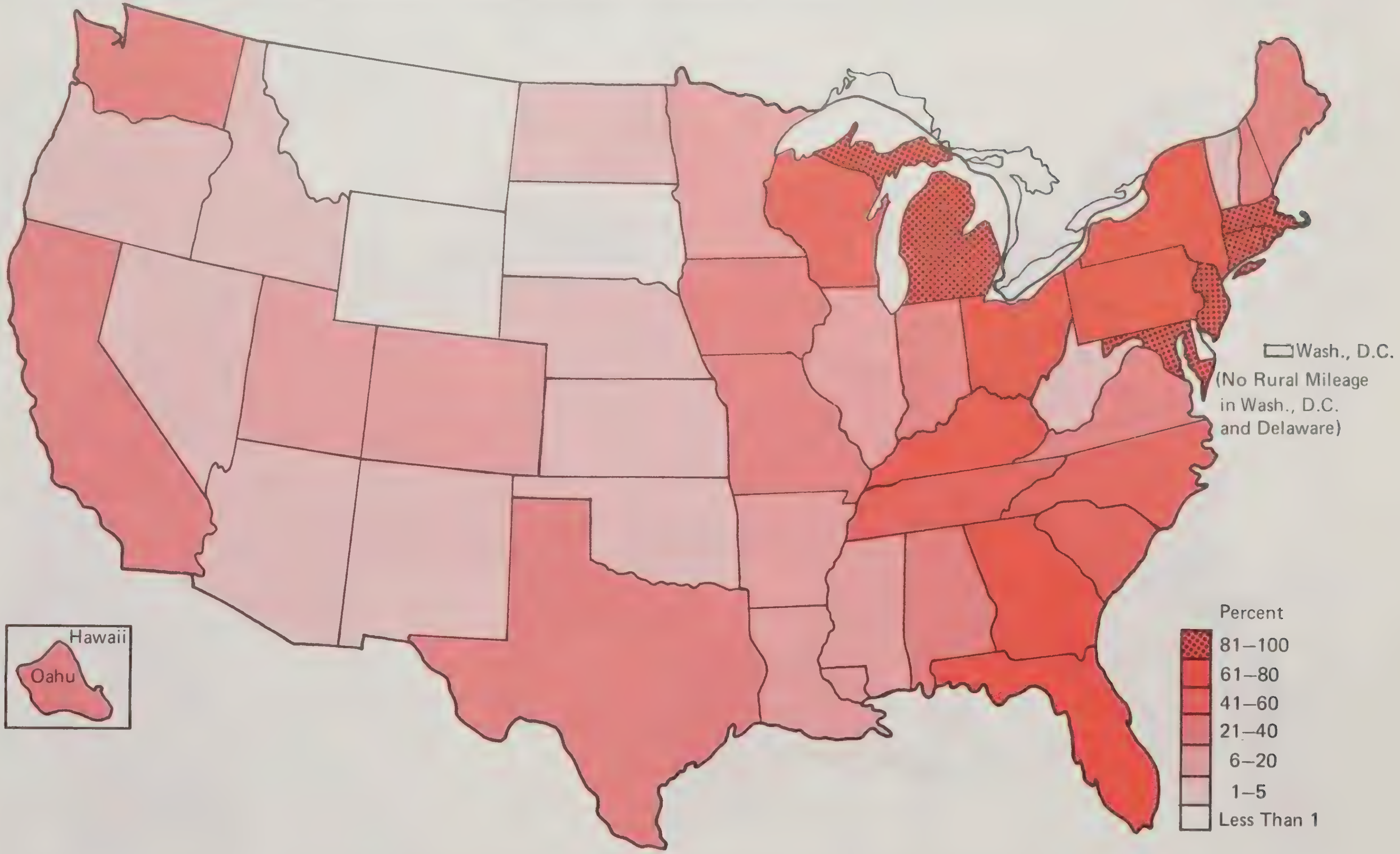
The military requirement for liners is established by the DOD and other agencies. In 1977, over 70 percent of DOD cargo was containerized.[347] In the event of mobilization, the DOD estimates that virtually the entire active U.S. merchant marine liner fleet will be needed, and that the combination of all shipping resources available is sufficient to meet requirements in the early months of war.[348] The DOD further states that key defense features must be added to liners to make them more useful for national defense. These include structural changes to ships

FIGURE 34. **Congested urban interstate mileage in 1990 (percent of traffic exceeding design volume).**


Wash., D.C.
Hawaii
Oahu
Percent
81–100
61–80
41–60
21–40
6–20
1–5
Less Than 1

SOURCE: U.S. Department of Transportation, *National Transportation: Trends and Choices (to the Year 2000)*, Washington, D.C.: January 1977, p. 144.

FIGURE 35. **Congested rural interstate mileage in 1990 (percent of traffic exceeding design volume).**


Wash., D.C.
(No Rural Mileage in Wash., D.C. and Delaware)
Percent
81–100
61–80
41–60
21–40
6–20
1–5
Less Than 1
Hawaii
Oahu

SOURCE: U.S. Department of Transportation, *National Transportation: Trends and Choices (to the Year 2000)*, Washington, D.C.: January 1977, p. 142.

themselves and system improvements such as onboard or shore-side cranes to make loading and unloading easier and faster.

The need for a U.S. dry-bulk fleet for national defense and security objectives is another matter.

An analysis by MarAd,[349] confirmed by the DOD,[350] states that dry-bulk carriers cannot be used for military cargo without extensive conversion; hence, there is no military requirement for this type of vessel. Regarding national security, in addition to the NATO shipping that would be available to augment the current domestic (Jones Act)[351] dry-bulk fleet, EUSC ships which are subject to requisition under Section 902 of the Merchant Marine Act would also be available. According to MarAd statistics, as of June 1977, 469 vessels were so registered; 339 were tankers and 102 were dry-bulk or other non-liner type carriers while the remaining 28 vessels were liners.

Despite the above, U.S. policy as expressed by MarAd is to promote aggressively the construction and operation of bulk ships. Since 1970, when these ships became eligible for construction differential subsidy (CDS), 48 bulk vessels have been subsidized.[352] Most of these were tankers. In 1978 the first dry-bulk vessels were approved for CDS.[353]

Under current policies and programs, and expected growth as defined in the medium-growth scenario, the U.S.-flag fleet as projected by the NTPSC is shown in Table 121, by category of ship. The funds, in 1976 dollars, needed to build the fleet are also shown in Table 121, cumulated by 5-year intervals. Since 1969, the average CDS as a percent of vessel price has been 44.49 percent for liners, 40.5 percent for bulk carriers, and 21.31 percent for LNG ships.[354] When these averages are applied to the capital costs, the expected CDS payments for LNG, bulk, and liner are as shown in Table 121. Under this scenario and assumptions, CDS payments to U.S. shipyards during the 25-year period 1976 to 2000 could total over $8 billion: $5 billion for liners, $844 million for dry-bulk carriers, $729 million for liquid-bulk carriers, and $1,451 million for LNG ships.

Cost categories of wages, maintenance and repair (M&R), and protection and indemnity insurance (P&I) have been identified as those which have traditionally been subsidized for liner-type vessels. Comparable data are not available for dry-bulk vessels. Preliminary ODS estimates by MarAd, however, indicate the following cost differentials for bulk vessels.[355]

Wages:	80 percent
M&R:	25 percent
P&I:	25 percent

Typical annual costs were obtained for a 170,000-ton dry-bulk vessel.[356] The daily operating costs for this representative vessel, with a 41-person crew, were $6,425 (in 1976 dollars). Of this total, about $5,060 was for wages and subsistence, $801 for maintenance, rehabilitation, and equipment, $479 for insurance, and $85 for other expenses. Using the cost differential percentages for the categories shown above, the daily ODS would be $4,368. The annual cost per vessel would be over $1.5 million, or (as shown in Table 121) when applied to the projected dry-bulk fleet a total of almost $1 billion through the year 2000, in constant 1976 dollars. For purposes of impact analysis, it was assumed that, although crew size may fall, other costs will increase so that total subsidized costs per vessel should remain constant in real terms.

IMPACTS OF NTPSC POLICIES

It has been established by the DOD that military requirements for shipping, in the early months of a national emergency, can be met by the current U.S.-flag liner fleet.[357] As projections of this fleet show it remaining almost constant through the year 2000 in terms of number of ships, it would appear that strong arguments can be made to continue U.S. government support for this segment. Although the potential CDS required to construct this fleet is $5 billion through the year 2000, the actual amount provided will probably be less, because U.S. liners are quite competitive and more operators may choose to operate without subsidy.[358] This is because as capital costs increase in proportion to operating costs, ODS becomes less important. Firms not requiring ODS may turn to the world market to produce ships, as the price may be lower than the CDS-aided vessel costs. This is illustrated by the fact that of the 208 liner vessels constructed under Title V of the Merchant Marine Act, only 20 have been subsidized since 1972.[359]

Although there is no military need for dry-bulk or LNG vessels, MarAd claims that additional tankers and bulk ships are necessary for national security purposes (i.e., movement of critical raw materials).[360] A question arises as to whether these vessels need to be U.S.-flag, as opposed to "Effective U.S. Control" vessels. Even under current subsidy programs it is highly unlikely that these ships will be registered as U.S.-flag vessels. The subsidy program would have to be significantly expanded to make this an attractive option for U.S. operators.

The NTPSC proposes to tighten the eligibility requirements of ODS and CDS to stress ships that meet an established national defense need. Under this policy and expected conditions (of the medium-growth scenario), liners would receive CDS and ODS in the same amount as would occur under a "no change" policy. The cost of these vessels would be about $11 billion, of which a maximum CDS would be about $5 billion through 2000.

TABLE 121. **Costs and subsidies for the U.S.-flag merchant fleet in foreign trade, medium-growth scenario, 1980 to 2000 (5-year totals in millions of 1975 $)**

	Year						
Vessel Category	1975	1976 to 1980	1981 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	Total 1976 to 2000
LINER							
Fleet inventory at end of period	207	184	203	198	224	220	
Capital Costs		$1430	$1353	$1587	$2494	$4259	$11,114
CDS[a]		$ 643	$ 609	$ 714	$1122	$1916	$5,004
BULK							
Fleet inventory at end of period							
Total	43	56	71	83	104	117	
Dry Bulk	3	6	19	28	41	55	
Other Bulk[b]	40	50	52	55	63	62	
Dry Bulk							
Capital Costs		$120	520	360	520	560	$2,080
CDS		$49	211	146	211	227	$844
ODS[c]		$37	104	185	278	385	$989
Other Bulk							
Capital Costs		$500	200	300	800	—	$1,800
ODS		$203	81	122	324	—	$729
ODS		$392	433	459	510	535	$2,329
LNG							
Fleet inventory at end of period	0	6	23	31	39	44	
Capital Costs		$649	2,181	1,043	1,772	1,176	$6,821
CDS		$138	464	222	377	250	$1,451

SOURCE: NTPSC forecasts.

NOTE: Totals may not add due to rounding.

[a] Construction differential subsidy.

[b] Includes tankers, neobulk, and combination carriers. (Neobulk refers to a vessel service with attributes of both liner and tramp-shipping services. Frequencies are similar to liners; rates approach those offered by tramps; shipments are longer than those on liners.)

[c] Operating differential subsidy.

U.S.-flag dry-bulk vessels would, however, be significantly reduced from projected levels. Under current policy, the projected dry-bulk fleet would receive the following subsidy through the year 2000, in 1976 constant dollars:

CDS (1976 to 2000):	$, 844 million
ODS (1980 to 2000):	$, 989 million
Total Subsidy	$1,833 million

In addition, much of the required capital in excess of the CDS would be obtained using Federal loan guarantees. When considering inflation, even a low average annual increase during this period would raise the government subsidy required to two or three times the above amount in current dollars.

Under the proposed policy change none of this subsidy would be provided. The only effect of this change, because there is no private demand for unsubsidized vessels, would be in the loss of new jobs that would have been created to expand shipbuilding facilities and to crew additional ships. If the entire number of U.S.-flag dry-bulk vessels projected for 2000 (55 ships) was not built or operated, the NTPSC estimates less than 2,000 new jobs would be foregone.

In the LNG category it is estimated that about half of the projected LNGs would receive CDS, and that none would apply for ODS. Thus, the potential savings to the U.S. government is estimated to be one-half of the maximum CDS available (half of $1,451 million), or $725.5 million. As was the case with the dry-bulk vessels, the jobs lost would be primarily those that were not created in the shipyards.

In summary, implementation of this policy change would have the following impacts:

1. Not affect quantity or quality of service to shippers;
2. Not affect costs to shippers;
3. Not affect safety;
4. Save the Federal government almost $2 billion in constant 1976 dollars through 2000;
5. Forego at most about 2,000 jobs;

6. Conserve energy from the construction and operation of ships; and
7. Not affect national defense, except perhaps for critical materials movement.

Another possible policy modification would be to require subsidies for incremental national defense features (special items added to U.S.-constructed ships such as wider hatches sufficient to handle military equipment) to be carried as a line item in the DOD budget, and to limit such subsidies to ships which fulfill a defense need.

The average incremental national defense cost per ship constructed since 1974 was only about $83,000, while the price per ship averaged over $56 million.[361] If this relationship (0.15 percent) is applied to required capital costs for liners (see Table 121), national defense costs are as follows:

Years	Costs	Avg. Annual Costs
1976 to 1980	$2,145,000	$ 429,000
1981 to 1985	$2,029,500	$ 405,900
1986 to 1990	$2,380,500	$ 476,100
1991 to 1995	$3,741,000	$ 748,200
1996 to 2000	$6,388,500	$1,277,700

These costs are so small compared to the annual DOD budget that they will have no adverse impacts on allocation of funds. Implementation of this policy would put the program under the DOD control, which might allow better use of the funds plus the consideration of other key defense requirements that are not now met (e.g., addition of portable cranes).

Inland Waterway Aids

NTPSC Policy Recommendations

The NTPSC recommends that the Inland Waterways Trust Fund be maintained through the year 2000. All tax rates, funding eligibility limitations, and user exemptions are to remain as currently prescribed in the legislation.[362]

The Inland Waterways Revenue Act of 1978 established a tax on fuel used in commercial transportation on inland and intracoastal waterways, the revenues from which are to be deposited in the Inland Waterways Trust Fund. Trust Fund revenues can then be applied to "construction and rehabilitation expenditures for navigation on the inland and intracoastal waterways."[363]

The tax is a flat rate with no variation by geographic region or waterway which is gradually increased from 4 cents per gallon in 1980 to 10 cents per gallon in 1985. Table 122 sets out the expected contribution of these revenues to Federal water expenditures for barge-line transportation.

TABLE 122. Expected contribution of fuel tax to Federal expenditures, 1985, 1990 and 2000 (percent)

Year	Tax Revenues as Percentage of OM&R[a]	Tax Revenues as Percentage of New Construction	Tax Revenues as Percentage of Total Outlays
1985..	15.6%	17.2%	8.2%
1990..	15.9%	20.0%	8.9%
2000..	10.9%	17.4%	6.7%

SOURCE: NTPSC forecasts.

[a] OM&R includes Corps estimates and Coast Guard aids to navigation.

Chapter 11 gives estimates of Federal expenditures and receipts for inland waterway activities. The waterway fuel tax covers less than 16 percent of waterway expenditures and by the year 2000 will cover only about 11 percent. In terms of total outlays the fuel tax will cover less than 9 percent of all costs, down to about 7 percent by the year 2000. It should be noted, though, that Trust Fund revenues will only be expended on new construction *and* rehabilitation. It was not possible to calculate these costs.

FUEL TAX AND WATERWAY TRAFFIC FORECASTS

Before describing the potential impacts of the NTPSC policy on national goals, it is necessary to estimate the effect of the fuel tax on waterway traffic, to indicate the magnitude of the impact on the various goals. The NTPSC projections in Chapter 9 were made prior to the passage of Pub. L. 95–502 and do not take into account any diversion which the fuel tax might cause. To gain an idea of what level of diversion could occur, several studies have analyzed the effect of fuel taxes on barge rates and the probable responses of shippers of different commodities.

A CACI study in 1976 assessed the effect of setting a systemwide fuel tax at a rate equivalent to 50 percent recovery of OM&R and navigation aids costs. On the lower Mississippi River, towing costs would have increased from 2.4 to 2.7 mills per ton-mile and on the Missouri River from 3.1 to 3.5 mills. This increase, traced through the system, would result in a 5.5 percent drop in ton-miles.[364] The legislated fuel tax, as discussed above, is significantly less than that required by a criterion of 50 percent recovery. The data in the study, however, are from 1972. Since that time fuel prices have more than tripled for waterway users, which could affect the results in either direction.

A Transportation Systems Center (TSC) study in 1977 further substantiates the conclusion that the actual legislated fuel tax should not significantly alter projected traffic flows. It found that a fuel tax set at 100 percent OM&R recovery would result in barge rate increases ranging from 6 to 15 percent, with delivered commodity price increases of never more than 1 to 2 percent and usually less than 1 percent.[365] The impact would vary dramatically by commodity: coal would experience little or no diversion, mainly because only 10 percent of water-served electric utilities have adequate rail facilities, but corn movements would experience 20 percent diversion in ton-miles.[366] Again, the legislated fuel tax is much less than would be a tax based on the 100 percent cost-recovery assumed by TSC, and the impacts, similarly, are much less.

In addition to the above, preliminary estimates from the Mid-America Ports Study are that a 12 cent per gallon fuel tax would divert 3 percent of projected traffic volumes on the Mississippi River system.[367]

A recent study focussing on the Tennessee area, however, indicates that in some regions shippers are sensitive to relatively small increases in barge rates. In a sample of 32 shippers, 5 would "abandon entirely" their waterway carriers if barge rates increased by 10 percent.[368] Questions directed at possible gradual erosion of waterway usage revealed even more dramatic diversions. Unfortunately the sample size is small and the effect on actual ton-miles is not treated. One interesting finding, contrary to the TSC results, is that over 90 percent of the sample firms had viable rail access as an alternative to waterways.[369]

After reviewing the above studies it is apparent that a 10 cent per gallon fuel tax should not significantly affect the NTPSC forecast.

IMPACTS

Adequate Service

The policy is basically to maintain the status quo which leaves funding levels up to annual appropriations and new construction up to project-by-project review. The effect of the fuel tax will depend on whether the revenue will replace a portion of normal Federal outlays or whether it will be additive. In terms of overall expenditures, though, the proportion represented by the fuel tax is small and should have little positive or negative effect on service.

Appropriate Rates/Prices

In terms of the policy's direct impact on prices, the impact is negligible. The fuel tax will not reach 10 cents per gallon until 1985. Assuming that fuel prices in general will rise, the tax could mean an increase of 20 percent over the base price. If fuel is 16 percent of towing costs (as suggested in Chapter 11) the towing price rise would amount to 3 percent. Going one step further, the increase as a proportion of the delivered price of a commodity would be insignificant.

The problem remains, however, as to whether the resultant barge rates and other waterway users' costs are "appropriate." Since it is evident from the estimate of tax revenues and Federal expenditures that waterway users and other beneficiaries are receiving a significant subsidy (over 90 percent of Federal outlays for inland waterways), it can be concluded that the rates are below actual resource costs. Prior legislation provides no clearly specified justification or rationale for such a subsidy in terms of national benefits. The problem becomes even more serious in future years as Federal outlays, and thus subsidies, must be used to meet increasing needs.

Also, it must be determined whether the present fuel tax properly distributes costs among the various waterway users so that they are paying for the costs which they impose. A systemwide fuel tax assumes that Federal expenditures per ton-mile are equal across the various river segments. Obviously this is not the case, as is demonstrated in Table 123. The Federal cost per ton-mile varies so widely between river segments that 3 percent of the ton-miles account for 48 percent of Federal O&M costs.[370] The fuel tax, then, leads to a cross-subsidy from users of low cost segments to users of higher cost segments.

Another important issue is the amount of cross-subsidy between types of waterway users. The fuel tax applies only to commercial vessels and does not cover recreational boating which represents a high proportion of lockages on certain river segments. Although pleasure boats pay a net 2 cents per gallon fuel tax, the revenues are placed in the Land and Water Conservation Fund in the Department of the Interior.[371]

In August 1975, 31 percent of the lockages at 8 locks on the Illinois River were due to recreational vessels. During that same month almost all users on the upper locks of the Allegheny River were recreational users.[372] A cost allocation study for waterways, similar to that which was done by the Federal Aviation Administration, should be undertaken. The user charge study mandated in the Inland Waterways Revenue Act of 1978[373] should address this issue.

Although the instrument of a flat systemwide fuel tax may result in inappropriate prices, the currently legislated fuel tax represents such a small proportion of delivered commodity prices that its discriminatory or cross-subsidy effects are insignificant.

Economic Efficiency

Subsidization of inland waterway facilities and services should, theoretically, result in excess demand by users who, if charged fully allocated costs, would alter product prices, reduce shipments, select a different mode or simply not make the shipment.

TABLE 123. Segment ton-mile taxes required to recover operation and maintenance expenditures for shallow draft projects undertaken by the Army Corps of Engineers

Waterway Segment	Average Annual O&M Expenditures FY 1970–74 (thousands of dollars)	Actual Ton-Miles CY 1972	O&M Cost per Ton-Mile (Tax Required) (dollars)	Commercial Cost per Mile to Move Loaded 1500-Ton Barge (dollars)
Allegheny River	$, 990	80,025	[a]$ 12.4	$ 18.60
Apalachicola–Chattahoochee	2,028	108,210	[a]18.7	28.05
Arkansas–Verdigris–Waterway	12,657	520,887	[a]24.3	36.45
Atlantic Intracoastal Waterway (Norfolk–Miami)	3,265	691,882	4.72	7.08
Columbia River (Pasco vicinity–The Dalles)	17,225	2,688,815	[a]6.4	9.60
Cumberland River	915	882,021	1.04	1.56
Green and Barren Rivers	852	1,467,228	.58	.87
Gulf Intracoastal Waterway	5,292	19,035,605	.27	.41
Illinois Calsag Waterway (Indiana Harbor–Miss. River)	4,723	8,350,420	.57	.86
Kanawha River	1,294	815,333	1.59	2.39
Kentucky River	1,084	39,748	[a]27.3	40.95
Lower Mississippi River (Cairo–Baton Rouge)	7,953	60,563,824	.13	.20
Missouri River	12,363	1,280,385	[a]9.7	14.55
Mobile–Tombigbee Warrior	2,102	3,816,879	.55	.83
Monongahela River	2,271	1,528,000	1.49	2.24
Ohio River	12,984	32,055,618	.41	.62
Ouachita–Black Rivers	1,649	101,949	[a]16.2	24.30
Tennessee River	2,171	3,755,867	.58	.87
Upper Mississippi River (Minneapolis–Cairo)	10,027	22,304,761	.45	.68
Williamette River	2,369	20,640	[a]114.8	172.20
Total	104,214	160,108,097	.651	0.98
Total of High-Cost Segments	50,365	4,840,659	10.4	15.6
Percent High-Cost Segments	48%	3%		

SOURCE: U.S. Army Corps of Engineers, *Waterborne Commerce of the U.S.*, 1970–1974 Calendar Year (CY) data, as cited in American Enterprise Institute, *Waterway User Charges*, Washington, D.C.: 1977, p. 15.

[a] High-Cost Segments

Table 124 shows the potential impact of segment charges (set at 100 percent recovery of OM&R) on various waterway segments and indicates that excess demand has occurred. Seven segments are so expensive that 100 percent of all ton-miles would be diverted.

Although the Corps of Engineers conducts economic analyses of its construction projects to assure that the benefits exceed the costs, inefficient pricing on the waterways will still lead to improper project appraisals by inflating demand for the facility. The benefit/cost analysis will then take demand as a given which is used to calculate the benefits with and without the proposed project or for different alternative improvements.

The fuel tax, while beginning the task of cost recovery, is not designed to differentiate between high cost and low cost facilities and could, if raised to high enough levels, exacerbate the situation by diverting traffic away from lower cost waterways. The DOT study suggests that a fuel tax could raise barge rates higher than segment tolls, resulting in greater traffic losses because of the inherent cross-subsidy.[374] The tax rate prescribed in the Waterway Revenue Act, however, is low enough that it should not significantly affect economic efficiency in either a positive or negative manner.

Segment tolls instead of, or in addition to, fuel taxes raise other problems which must be assessed before implementation. Due to being directed at a limited geographic area, the social and economic impacts of a segment charge on a high-cost river could be severe, and remedial efforts could be required to minimize such effects.[375]

In the long term, the NTPSC policy, by maintaining low fuel taxes, will sacrifice possible gains in economic efficiency that might accrue from proper pricing of waterway facilities and services. Federal outlays (subsidies) will have to be raised to meet the needs of increasing waterway traffic.

Energy Conservation and Development

The policy's impact on energy goals can be evaluated from two perspectives: the effect on the price of transporting energy materials and the effect on the consumption of energy by the transport sector. In both cases, the tax rate is so low that no significant impacts are expected.

TABLE 124. Estimated diversion of waterborne traffic under segment-specific user charges sufficient to recover 100 percent of other costs

Name of Segment	Percent of Ton-Miles Diverted
Mississippi River–Cairo to Baton Rouge	10.5
Mississippi River–Minneapolis to Cairo	7.4
Arkansas River	100.0
White River	.1
Ohio River	6.8
Monongahela River	2.6
Allegheny River	100.0
Tennessee River	6.5
Cumberland River	21.3
Kanawha River	3.0
Green and Barren River	.4
Kentucky River	100.0
Illinois Waterway	6.2
Gulf Intercoastal Waterway – West	7.7
Morgan City – Port Allen Route	9.5
Gulf Intercoastal Waterway – East	7.2
Pearl River	100.0
Alabama – Coosa River	43.9
Warrior – Tombigbee – Mobile River	.8
Missouri River	100.0
Apalachicola – Chattahoochee River	100.0
Atchafalaya River	20.0
Red River	—
Black and Ouachita River	100.0
Mississippi River – Baton Rouge to Mouth of Passes	11.5

SOURCE: U.S. Department of Transportation, Transportation Systems Center, *Modal Traffic Impacts of Waterway User Charges* Volume 1, Cambridge, Mass: p. VIII–9,) as reported by Congressional Budget Office, *Financing Waterway Development: The User Charge Debate,* Washington, D.C.: July 1977, p. 26.

The impact on the price of energy due to barge rate hikes is minimal. From a national perspective, most coal and oil is transported by rail and pipeline and will remain unaffected.[376] For that portion of coal and petroleum products carried on the waterways, the effect on the delivered price should be less than 1 percent.

Opponents of the waterway user charge have argued that barge operations are more energy efficient than alternative modes.[377] To determine the truth of this argument would require more detailed analysis of energy consumption for each commodity flow with and without the fuel tax. A review of modal efficiency studies suggests that barge operations represent only "a marginal fuel advantage . . . over rail."[378] In any case, the diversion due to a 10 cents per gallon fuel tax is too little to affect energy consumption significantly.

Environmental Protection and Enhancement/Safety

It has been argued that maintaining a high level of subsidy to the waterways leads to over-development of waterway facilities and unnecessary environmental damage because it generates excess demand.[379] Other analyses, however, show that the waterway use provides a net benefit in terms of environmental and safety factors when compared with alternative transport modes.[380]

Industry Promotion

Maintaining the level of cost recovery implicitly indicated by the proposed NTPSC policy signifies the promotion of inland waterways over alternative transport modes. The flat rate fuel tax, in cents per gallon, results in steadily increasing subsidies to waterway users rising from $413 million in 1975 to $610 million in 2000 (in 1975 constant dollars net of fuel tax receipts).

Opponents of waterway user charges suggest that a modal comparison of Federal subsidies would reveal that other modes are receiving much greater subsidies and that the existing Federal outlays for waterways are one way of providing equity among modes.[381] Although the absolute amount of subsidy for waterways may appear small, when stated as a percentage of expenditures by users, it is in fact, much more substantial, as shown in Table 125. In 1976, the Corps' shallow-draft inland expenditures represented 41 percent of inland waterway freight revenue while Federal subsidies to rail represented 3 percent of revenues. Furthermore, if Federal payments to the Railroad Retirement Fund are considered as a subsidy and it is assumed that future rail aid will not be repaid, the rail proportion will not rise above 6 percent.[382]

Government subsidies could be compared on a modal basis by region and by market, although no such analysis has been made. In this way it could be determined whether subsidies give an unfair advantage to one or another of competing and geographically parallel modes.

The Federal inland waterway outlays do indirectly promote the use of certain rail lines where a combined rail/barge movement is concerned.[383] Using coal as an example, the NTPSC projections indicate that 50 percent of the coal tonnage on the inland waterway and the Great Lakes will be involved in a rail/barge movement. By keeping barge rates low through Federal subsidies, the overall rail/barge rate also can be maintained at a low level, providing traffic for both the rail carrier and the barge operator.

STATE AND LOCAL TAXATION OF RIGHTS-OF-WAY

NTPSC Policy Recommendations

Proper user fees at the Federal level must be balanced with appropriate fees assessed by state and local taxing jurisdictions. The NTPSC recom-

TABLE 125. Transportation subsidies as a percent of expenditures by users, 1974 to 1976

Fiscal Years	1974	1975	1976
Air Transportation			
Air Carrier[a]	1	1	1
General Aviation[b]	12	13	14
Highway Transportation[c]	—	—	1
Railroad Transportation			
Passenger[d]	54	82	113
Freight[e]	1	2	3
Water Transportation			
International Freight[f]	8	10	11
– U.S. Flag Only	29	37	41
Domestic Freight[g]	21	22	21
– Inland Only	47	44	41
Mass Transportation[h]	49	54	73

SOURCE: U.S. Congressional Budget Office, *Financing Waterway Development: The User Charge Debate,* Washington, D.C.: Government Printing Office, July 1977, pp. 15–16.

[a] The subsidy includes a portion of the Federal Aviation Administration's expenditures plus the subsidy to local service air carriers administered by the Civil Aeronautics Board. FAA expenditures and excise tax revenue were allocated between air carriers and general aviation on the basis of DOT's 1973 cost allocation study. Air Carrier revenue data for 1974 is from, U.S. Department of Transportation, *Summary of National Transportation Statistics,* Washington, D.C.: June 1976 (hereafter, DOT, *Statistics*); 1975 revenue from U.S. Department of Transportation, Office of the Secretary, *National Transportation Trends and Choices, (to the year 2000),* Washington, D.C.: Government Printing Office, January 1977 (hereafter DOT, *Trends*).

[b] Includes allocated FAA expenditures. General aviation expenditure data are from DOT, *Statistics* in 1974 and DOT, *Trends* in 1975.

[c] There was a negative subsidy in 1974 and 1975, as revenues exceeded expenditures, according to the CBO definitions.

[d] Includes grants to Amtrak as well as the principal of federally guaranteed loans. Revenue data from American Association of Railroads, *Yearbook of Railroad Facts, 1977,* Washington, D.C.: 1977, p. 14.

[e] Conrail security purchases are not included; they were $309 million in fiscal year 1976. Revenue data source same as in footnote d.

[f] Includes various subsidies from the Maritime Administration plus a portion of Corps expenditures for deep draft channels and harbors. Revenue data are from discussions with the Bureau of Economic Analysis, U.S. Department of Commerce.

[g] Revenue data from DOT, *Statistics* in 1974 and DOT, *Trends* in 1975.

[h] Includes various subsidies from the Urban Mass Transportation Administration plus Federal aid to the Washington, D.C. subway. Revenue data from American Public Transit Association, *'78 Transit Fact Book,* Washington, D.C.: May 1978, p. 20.

mends that the effect of taxation of rights-of-way should be equalized among modes by encouraging states and local governments to eliminate discriminatory taxation.

Impacts

It is widely believed that the railroads have historically been discriminated against in the area of state and local property taxes. Railroad property is often assessed at higher rates than other comparable commercial and industrial property. (The assessment rate is the percentage of the railroad's full value which is subject to taxation.) Also, other modes of transportation which compete with rail usually pay no property taxes on their rights-of-way, although most other modes now contribute to trust funds. Pipelines typically lease rights-of-way from Federal and state governments and there is no property tax on Federal or state lands. If rights-of-way are leased from a private owner (this arrangement constitutes a very small percent of total rights-of-way used by gas and oil pipelines), payment is usually in the form of an annual easement paid to the land owner, and any property tax is figured into the easement.[384]

Railroads developed before the advent of effective competition from other modes, and an ad valorum property tax in a time of high profits was not viewed as an unfair burden. Now, however, this tax may be considered to be discriminatory. In June 1961, the Senate Commerce Committee's study, known as the Doyle Report,[385] addressed discrimination against railroads by state and local property taxes and recommended that the collection of such taxes should be prohibited by congressional enactment.

The policy recommendations of the Doyle Report were not put into effect until the passage of the 4R Act in 1976. Section 306 of the Act prohibits discriminatory tax treatment of railroad properties. Discrimination can occur through: differential assessment between railroads and other commercial and industrial property; collection of taxes based upon such an assessment; a higher tax rate than other commercial and industrial property; and the imposition of any other tax resulting in discriminatory treatment.[386]

Discrimination now is not highly concentrated geographically, although there are several states along the Mississippi River from Iowa to the Gulf of Mexico which assess railroad property at apparently discriminatory rates.

Specific information concerning state and local tax agencies and their practices is difficult to obtain in full. The Bureau of Census publishes *Taxable Property Values and Assessment Sales Price Ratios,* which gives average assessment rates for each state.[387] These assessment ratios are based on actual sales of property within each state and therefore represent real assessment ratios (as opposed to nominal rates, which are published in the *All States Tax Handbook*).[388] When compared with the assessment rate per state applied to railroads taken from the Council of State Government's *State Taxation of Railroads and Tax Relief Programs,* the ratios show that there still exist gaps[389] between commercial and industrial assessment levels and assessment levels used for rail property. Table 126 illustrates the assessment differentials for 15 states.

State and local rail property taxes totaled approximately $287 million in 1976.[390] The selected states shown in Table 126 collect over half of said taxes. The table illustrates that substantial savings to railroads are possible if states act to revise their railroad property tax assessment practices. For example, if railroads' property were assessed at the same average real (sales-based) assessment ratios that apply to other commercial and industrial property, the railroads could save approximately $66.6 million in the states shown in the table. If railroads were taxed instead at each state's composite average nominal assessment ratio, the savings to railroads could be approximately $44 million in the states shown in the table. These savings are derived using the states' nominal rail assessment ratios. Comparable real rail ratios are not available. For this reason, the lower estimate of possible savings (comparing two nominal ratios) is likely to be more accurate.

Changes in assessing railroad property as a result of the 4R Act have apparently been slow. A survey conducted by the National Association of Tax Administrators (sent to all state tax agencies) found that nine states (Alabama, Arizona, Louisiana, Montana, Ohio, Texas, Virginia, Washington, and Wisconsin) perceive a change necessary in their state taxation of railroads. These changes range from equalization of assessment ratios with other commercial and industrial property to conducting sales ratio studies to determine fair market value of railroad property to be assessed.

Ten states (Idaho, Illinois, Indiana, Kansas, Maryland, Mississippi, North Dakota, Tennessee, Utah, and Vermont) are believed to be in violation of the 4R Act, but do not perceive a change in property tax laws affecting railroads to be necessary.[391]

PLANNING AND INFORMATION

The mandate of the NTPSC illustrates that national policymakers perceive deficiencies in current planning and information functions of the permanent Federal agencies; further, state and local governments have complained that Federal requirements placed on their planning and information-reporting activities are often inflexible and frequently too obtrusive.

NTPSC Policy Recommendations

In order to serve national policymakers more effectively and efficiently, Federal transportation planning

TABLE 126. Rail property taxation, by selected states

Selected States	% of Value at Which Railroad Property is Assessed[a]	State Composite Average for Assessment of Commercial and Industrial Property		Taxes Collected Assessed at State Railroads in 1975 (in millions)[a]	Estimated Savings to Railroads If Ad Valorem Property Tax Was Average for Commercial and Industrial Property	
	Nominal	*Nominal*[b]	*Real*[c]	*Nominal*	*Real*	*Nominal*
Alabama	30	24.7	16.7	$ 3.689	$1,635,462.5	$651,736.7
Arizona	60	27	[d]	8.416	[d]	4,608,553.7
California	25	22.4	17.1	31.44	9,841,507	3,238,981.0
Idaho	24.2	20	8.9	28.370	17,936,406	4,923,721.0
Louisiana	30	19.2	19.8	1.270	431,807.9	457,207.0
Mississippi	30	26.7	13.9	3.029	1 662,057.1	340,670.2
Missouri	100	28	20.8	7.296	5,778,432.1	5,253,120.1
Montana	50	36.8	[d]	4.877	[d]	1,287,528.3
New Jersey	100	74.17	73.0	3.514	948,778.7	907,666.3
North Dakota	45	18	8.5	2.775	2,250,833.9	1,665,000.2
Ohio	50	33.97	31.1	19.686	7,441,310	6,311,332.0
Oklahoma	40	20	8.7	2.580	2,020,048.1	1,290,000.1
Tennessee	55	32	27.6	11.126	5,342,772	4,652,692.0
Texas	100	38.6	17.1	10.269	9,113,001	6,305,167.0
West Virginia	55	51	39.3	7.060	2,015,308.8	2,015,308.8
Total					66,616,105.1	43,908,684.4

SOURCE: NTPSC calculations based on the following references:

[a] *State Taxation of Railroads and Tax Relief Programs,* Council of State Governments, 1977.

[b] Nominal figures from *All States Tax Handbook,* Prentice Hall, 1977.

[c] Real figures from *Taxable Property Value and Assessment/Sales Price Ratios,* Bureau of Census, 1977.

[d] Real figures not available.

and information activities should be changed so that the Federal government:

1. *Plans largely for Federal transportation facilities and services that affect the national interest, such as those on Federal lands. State and local agencies, with Federal cooperation, should plan more effectively for other systems of interest;*
2. *Performs ongoing, systemwide, and forward-looking evaluations of the nation's transportation facilities and services, periodically assessing the current and future capability of the transportation system;*
3. *Improves integration among modes;*
4. *Discloses and publishes the transport impacts of activities in non-transportation sectors;*
5. *Provides Congress with timely and adequate plans (particularly considering the costs and effectiveness of Federal policies and programs) as guidance for the appropriations process; and*
6. *Provides the private sector and state and local governments with the most accurate information available on government plans and intentions for the transport system, as well as trends in the performance of the system so that their plans can be made in a more confident and knowledegable atmosphere.*

Federal transport planning should seek to consider all elements of supply and demand for the transportation system and to support appropriate private sector participation in that system. These ends can be accomplished by three basic policies:

1. *The Secretary of Transportation should regularly present objectives for congressional approval to guide and evaluate national transportation policies;*
2. *Using the congressionally approved transportation objectives, the Secretary of Transportation should regularly report to Congress on the state of the nation's transportation system, the impacts and effectiveness of all current Federal activities affecting transportation, and the appropriations needed to continue to modify those Federal activities which are beneficial; and*
3. *New Federal legislation and regulatory actions should be evaluated before and after implementation to determine consistency with the congressionally approved objectives and with other Federal policies and programs, to provide information for the Secretary's annual report, and to determine whether the action should be continued, modified, or terminated.*

Federal requirements and constraints placed on state and local transportation planning should be reduced. Required planning efforts which are redundant or unnecessary should be eliminated, and the scope and detail of planning should be allowed to match local needs. State and local governments should provide the information necessary for Federal evaluations of nationwide policies and programs. These ends can be served by:

1. *Reducing specific Federal requirements for state and local transportation planning activities except those necessary to evaluate current and prospective nationwide programs and to determine effects on transport facilities and services of national significance;*
2. *Improving the A–95 review process*[392] *to assure that any impacts on transportation of non-transportation policies are given adequate consideration; and*
3. *Allowing greater flexibility in the use of Federal funds for planning. Specifically, any portion of Federal categorical transportation aids could be used, at state and local option, for planning purposes.*

The Federal government should continue to provide technical advice and training, and to develop planning methods with state and local transportation planners. The private sector should be encouraged to participate fully in planning and in the development and use of data and methods.

Impacts

The NTPSC recommendations seek to clarify DOT's responsibility and provide the institutional mechanisms required to assure a continuing, coordinated effort to collect both statistical and bibliographic information.

The development of national data centers in other functional areas, such as health, education, and labor statistics, has been beneficial. A national data center for transportation could provide a comprehensive picture of the state of U.S. transportation, permitting DOT to monitor trends in supply and demand and to anticipate future needs. Without it, the work of the Congress, the DOT, and other Federal agencies charged with transport-related functions, such as energy, the environment, and urban development, has suffered. The lack of information for important transport sectors (e.g., agricultural flows by motor carrier) has led to multiple efforts by agencies to meet their needs independently through individual data-collection efforts which are time-consuming and expensive. No central location exists to identify existing data sources, or to allow users to make their needs known and coordinate their efforts.

The Federal government supports important research and development activities benefiting transportation. For example, FAA and NASA support programs for the air mode; FRA maintains its own rail test center; EPA, NHTSA, DOE, and FHWA all support research and development for highway modes; and UMTA supports urban transit research.[393]

DOE administers some of its research jointly with NASA, and it supported some of the NTPSC's research projects.[394] Research and development activities should be better coordinated so that spillovers from different research efforts can have maximum effect.

The NTPSC recommends that more Federal dollars should be available to support research of national importance for which benefits are expected to exceed costs. Efforts should concentrate on innovations with potential for assimilation into the transportation system.[395] Thus, Federal agencies should be sensitive to the marketability of the research that they fund.

The NTPSC's research has indicated several technologies with great potential for benefiting the U.S. transportation system.[396] These include both "hard" and "soft" technologies, ranging, for example, from totally new aircraft engines to operational improvements using auxiliary engines. New hardware, designs, system processes, and more efficient use of existing technologies were all considered.

Providing the proper Federal stimulus to research and development may require the use of cost-effective demonstrations, such as UMTA's demonstration of Downtown People Movers (DPMs) in eleven cities. UMTA is seeking to demonstrate with its DPMs the longer term impacts of such transit systems.[397] In the view of the NTPSC, a Federal role in demonstrations, just as in research and development, can often be cost-beneficial.

Policy recommendations for planning and information differ from other policy areas in that their focus is on the *process* by which decisions are made rather than on the transportation activities which result. As a consequence, the impacts are for the most part indirect. The few direct impacts which can be measured, such as changes in budgets for planning and evaluation activities, can be misleading, because changes in planning activities may result in major savings or reordering of priorities in the regulation, finance, and operation of transportation.[398]

GOVERNMENT ORGANIZATION

COORDINATION OF POLICIES AND PROGRAMS

The NTPSC identified over 1,000 Federal transportation policies and programs administered by 64 separate agencies.[399] Even if all of the policies and programs were implemented by one agency, the sheer bulk of these activities, and their great diversity, would make coordination difficult. The fact that they are implemented by so many separate agencies makes coordination virtually impossible. Could fewer agencies, policies and programs accomplish as much with less resources? Should all transportation policies and programs be consolidated, even if such transportation is used as a means to deliver other public services?

Elimination of outmoded agencies, policies, and programs is rare, as these often develop constituents that profit from the status quo and work against change. Too often, eliminating existing agencies, policies, and programs seems to be an admission of defeat, while creating new ones is seen as a promise of future success.

In addition, many transportation policies and programs are seen as a means to other ends. For example, HEW's efforts to improve educational opportunities depend on the clients' gaining access to the programs, and HEW therefore becomes involved in providing transportation. HEW is not in the business of coordinating transportation services, so while the agency may seek to avoid duplication in its educational programs, it may pay less attention to disincentives to transportation coordination that its programs create.

NTPSC Policy Recommendations

The NTPSC recommends that coordination efforts among agencies should begin, and once underway, they should be continually improved. In the view of the NTPSC, conflicts would be eased if there were fewer programs and agencies. On the other hand, not all transportation functions of non-transport agencies should be combined, as this might undermine the non-transportation programs.

Impacts

Regarding the impacts of revised Federal organizational structures, the recipients of transportation grants are among the greatest critics of the present situation. In testimony to the NTPSC, representatives of the National Governors' Association, AASHTO, National League of Cities, National Conference of State Legislatures, and individual states, counties, and cities all pointed to delay, waste, and duplication in obtaining and using Federal funds.[400] Apparently, no systematic quantification of these effects has been made, although particular incidents are often documented. One striking example is *Red Tape I, II and III,* a series of reports by the Los Angeles County Road Commissioner, which contained photos of comparative piles of paperwork for federally-funded versus non-federally-funded projects.[401]

Section 404 permits and 13(c) certification are frequently cited as generating ill-will among other levels of government, but the actual adverse effects of these programs may be less apparent than the fears of harm (and, of course, benefits may also accrue from the programs).[402]

An estimate of the private costs to comply with regulatory paperwork for the year ending June 1976 is over $850 million per year, as shown in Table 127.

DOT reported to the U.S. Regulatory Council that the first two years of its continuing program to simplify regulations had significant benefits. For example, FHWA saved over 105,000 work hours per year, valued at $1.5 million annually; by eliminating 68 forms and reducing the frequency of other reporting forms, it saved 8,468 annual hours of reporting time. FAA reduced reports required by air taxi and other commercial aviation operators by two-thirds, saving 200,000 hours of their time. UMTA reported reductions of its paperwork by 75 percent. The Coast Guard estimated that 90,000 work hours a year will be saved by industry and government as a result of its changes.[403]

The NTPSC supports these reductions in paperwork, and seeks to ensure that the gains continue.

CONGRESSIONAL COMMITTEES

NTPSC Policy Recommendations

The NTPSC recommends that the wishes of each House of Congress be respected concerning its internal organization.

Impacts

Such study groups as the Doyle Commission, and select committees of Congress itself, have proposed specific changes, such as reorganizing congressional committees to form a single authorizing committee in each House, perhaps with subcommittees organized along modal, or market lines.[404] For example, the 1973–74 Bolling Committee stated:

> Transportation today is a critical national problem, a public need and in part a Federal responsibility. By bringing together responsibility for urban mass transportation, some aspects of inland waterways, railroads and civil aviation, and highways and roads, the House of Representatives will have an institutional focus capable of integrating national and regional transportation policies. Because coherent and successful transportation policies depend upon regulation as well as upon development and promotion, the Select committee includes in the proposed committee, jurisdiction over the transportation regulatory agencies—that is, the Interstate Commerce Commission and the Civil Aeronautics Board.[405]

At the beginning of the 94th Congress, House committee jurisdiction was revised by H. Res. 988. The Committee on Public Works and Transportation was given jurisdiction over transportation generally, including transit, civil aviation, water transportation, roads and road safety, and transportation regulation except for ICC regulation of railroads, the Federal Railroad Administration, and Amtrak. The Committee on Interstate and Foreign Commerce retained its jurisdiction of railroads generally, including rail labor, and railroad retirement and unemployment. The Committee on Merchant Marine and Fisheries was given responsibility for the U.S. Merchant Marine generally, including the regulation of common carriers by water not under ICC jurisdiction, navigation laws, and the registering and licensing of vessels. The Science and Technology Committee received jurisdiction related to civil aeronautics research and development.[406] These jurisdictional guidelines have remained the same up to and including the 96th Congress.

Reorganization of the committee system of the Senate was studied in 1976 and was acted upon in February 1977. Recommendations were made by the Temporary Select Committee to Study the Senate Committee System, and a resolution (S. Res. 4) was reported to the Committee on Rules and Administration. A major goal of the reorganization was to strengthen the committee system's ability to develop integrated legislation and perform comprehensive oversight in fewer committees, while still preserving acceptable levels of jurisdictional competition.[407] Transportation was cited by Senators in testimony before the Select Committee as an area in which the Committee system was unable to deal effectively because jurisdiction was spread among many committees and subcommittees. They felt that the Senate

TABLE 127. Estimates of private person-hours to comply with regulations

Agency	Person-Hours in FY 1976
CAB	283,780
FMC	69,500
ICC	2,670,790
DOT/FAA	3,065,138
DOT/FRA	238,609
DOT/NHTSA	204,911
DOC/MarAd	146,692

SOURCE: Special tabulation by General Accounting Office and Office of Management and Budget for Senate Governmental Affairs Committee.

should modernize jurisdictional assignments to facilitate enactment of laws which state comprehensive national policies.

A staff report to the Select Committee pointed out existing conflicts. The Commerce Committee was described as basically concerned with transportation and communications, but with interest in a wide variety of areas. Its transport functions and overlap were described as follows:[408]

> Commerce asserts primary jurisdiction over transportation. . . . In modern times, however, other committees have jurisdiction in the transportation area. Space travel is in the purview of the Aeronautical and Space Sciences Committee. Banking handles the authorizations of the Urban Mass Transit Administration. Armed Services is responsible for military transportation. The District Committee has primary jurisdiction over the Metro Transit System. Finance considers subsidies and trust funds for transportation. Government Operations has authority to create and oversee agencies dealing with transportation. Labor is in charge of railway labor matters . . . and, most important, Public Works has jurisdiction over highways, roads, streets, rivers, harbors, ports, bikeways, highway safety, and rural mass transit. Commerce has acted on the merchant marine, civil aeronautics, the Interstate Commerce Commission, tourism, cars, trucks, automobile safety and energy regulations, and the railroads.

With the exception of hearings on airline deregulation held by a judiciary subcommittee (traditional jurisdiction was with the Aviation Subcommittee of Commerce), the report concluded that:[409]

> . . . the jurisdiction of other committees over various aspects of transport has not recently presented clear jurisdictional conflicts with the Commerce Committee. Evidently, boundaries are clear enough that coordination can be worked out on a regular basis.

The Select Committee recommended a new consolidated committee on Commerce, Science, and Transportation.[410] While retaining most existing jurisdiction of the Committee on Commerce, it recommended new jurisdiction over transportation by adding construction and maintenance of highways from the Public Works Committee and urban mass transit from the Committee on Banking, Housing and Urban Affairs. Although Commerce would have comprehensive policy oversight for transportation, some overlap was anticipated with the Committees on Environment and Public Works, and Energy and Natural Resources. Matters such as user fees and pipelines were cited as appropriate examples for joint referral.

During its markup proceedings, the Committee on Rules and Administration made many modifications to Senate Resolution 4, as recommended by the Select Committee.[411]

The final jurisdiction of the new Committee on Commerce, Science, and Transportation, as amended by the Rules Committee and adopted by the Senate, had the following additional duties compared to those of the old Committee on Commerce:[412]

1. All aeronautical and space activities of NASA;
2. Highway safety; and
3. Transportation aspects of outer Continental Shelf Lands.

In addition, jurisdiction over construction of inland waterways was transferred from Commerce to the Committee on Environment and Public Works. The new Commerce Committee did not obtain authorizing jurisdiction for highways or urban mass transportation.

The Rules Committee felt that while transit had elements of both transportation and urban affairs, the transportation jurisdiction of the Commerce Committee is derived from interstate carriage, while urban mass transportation is an integral part of urban development.

Thus, the transportation jurisdictions of both Houses remain split among several committees. The NTPSC believes that improved decisionmaking will result from more unified committee structure. Nonetheless, uniformity is not always beneficial. As an experiment it may be desirable to encourage one House to organize its transportation responsibilities within one committee (with modal, market, or functional subcommittees), while the other House retains committees that split transportation jurisdictions but permit integration of transportation policymaking with broader social considerations (such as urban affairs for mass transit).

REGULATORY COMMISSIONS

NTPSC Policy Recommendations

The NTPSC recommends that a single residual Federal transportation regulatory commission be created to consolidate the duties of the ICC and FMC, and any remaining duties of the CAB when it expires in 1985. The new agency would consider fitness of for-hire carriers.

Impacts

Recommendations to consolidate the CAB, FMC, and ICC have been made in numerous transportation reports over the years. The 1938 proposals by the Transportation Association of America,[413] the Dearing and Owen study for the first Hoover Commission in 1949,[414] the Doyle Report in 1961,[415] and the report of the Ash Council in 1971,[416] all recommended consolidation. The Landis Report of 1960[417] evaluated the issue but did not make a recommendation.

Consolidation has most recently been considered by the U.S. Senate Committee on Governmental Affairs,[418] in a report recommending that all administrative and promotional activities be centralized in DOT, and a National Transportation Policy Act—modeled after the National Environmental Policy Act of 1969—set clear guidance for the Secretary of Transportation in the formation and administration of national transportation policies and programs. If these recommendations are implemented, the benefits of consolidating the CAB, FMC, and ICC are thought by the Governmental Affairs Committee not to be sufficient to warrant the effort and expense of creating a Federal Transportation Regulatory Commission.

Previous reports have suggested either an independent commission (composed of regulatory functions from the CAB, ICC, and FMC) or status as an independent agency within the executive branch, such as FERC within DOE. Whatever the chosen form of organization, as noted in the Ash Report, a single commission would be greatly burdened if it attempted to regulate the modes under the conflicting mandates of existing law. Thus, institutional reform cannot succeed without reform of regulatory policies.

It is assumed that consolidation of regulatory commissions would encourage coordination of overall national transportation policy. Such consolidation might provide an institutional framework for implementing national transportation policy for all modes and the new commission could more easily work with the U.S. Department of Transportation in that regard. Duplicative activity, personnel and facilities could be eliminated.

A consolidated commission could revise conflicting regulations and streamline procedures for intermodal and intermarket (intercity to international) shippers. Movement of shipments from the interior of the U.S. to points overseas has been frustrated when the shipment was transferred from a carrier regulated by one agency to a carrier regulated by another. The rules and regulations governing the shipment (including insurance requirements) change with each transfer. This cumbersome situation could be eliminated as a result of consolidation.[419]

Consolidation could reduce operating and capital costs for carriers. The Dearing and Owen study for the First Hoover Commission found that "... the diffusion of regulatory responsibility leads to competitive inequalities, over-expansion of transportation facilities, and uncoordinated service."[420]

INTERNATIONAL NEGOTIATIONS

NTPSC Policy Recommendations

The NTPSC recommends that the Department of State continue to take the lead role in international transportation negotiations. However, greater coordination with the Department of Transportation should be encouraged through the routine inclusion of a DOT representative as a full member of all U.S. negotiation teams. In addition, the State Department should seek better coordination with other agencies involved.

Impacts

Congressional hearings examining the results of recent international transportation agreements have increasingly focused on the need to institutionalize the negotiating process. The importance of ensuring that members of U.S. negotiating teams possess sufficient expertise in transportation, as well as an adequate data base on which to make decisions, has been voiced particularly by representatives of the international aviation industry, where tradition has tied market opportunities to the success of U.S. government officials in bilateral negotiations.

Currently the State Department plays the lead role in international aviation negotiations. A somewhat informal interagency task force comprised of representatives from the Department of State, the Civil Aeronautics Board, and the Department of Transportation has been created to establish the U.S. position and provide the necessary technical information for negotiation efforts. There is no requirement that all members of the interagency task force be informed of the progress of the negotiations and no apparent effort has been made to include input from the private sector or consumer representatives.[421]

Criticism of the negotiating process was aired most recently in congressional hearings after the signing of the U.S.-U.K. "Bermuda II" International Aviation Agreement. Members of the negotiating team freely admitted that there had been a great deal of tension between members of the interagency team due to disagreement about the relative ranking of the members from different agencies, as well as the irreconcilable positions being advocated by the agencies. Negotiations were further impeded by the fact that all members of the U.S. team were outranked by their foreign counterparts.[422] In response to the impasse, the President appointed a special ambassador who was given no detailed instructions on U.S. government goals.[423]

The results of the negotiating process were criticized, and ranking administration officials called for the reorganization of agency responsibilities ranging from the establishment of a cabinet level agency to deal with international transportation negotiations, to the replacement of the State Department's lead negotiating role by DOT.[424]

Difficulty with the negotiating process has hardly been confined to the aviation field. For instance, the terms of an agreement reached with the Soviet Union by the Chairman of the Federal Maritime Commission on the carriage of wheat (following the 1972 Soviet grain purchase) were rejected by the State Department. However, the agreement which State Department negotiators eventually reached was completely unrealistic concerning the allocation of the shipments between the flag vessels of the two nations. The restrictions on U.S. ports included in the agreement overloaded both the ports and the supporting transportation infrastructure, resulting in severe congestion in parts of the U.S. transportation system. Some of the grain rotted and third-flag ships of other nations ultimately carried the bulk of the shipment.

In general, agencies other than the State Department have limited knowledge of foreign nations and an unclear view of U.S. purposes abroad or of the interplay between the action taken by the agency and the actions of the rest of the Federal government. Major studies of alternatives for the reorganization of government for the conduct of foreign policy have concluded that if separate agencies are allowed to adopt their own policies through alignments with foreign counterparts, the ability of the U.S. government to present a unified foreign policy would be seriously undermined.[425]

However, the effects of the recent negotiating efforts mentioned in both the aviation and maritime fields serve to emphasize the need for greater coordination of agency resources and establishment of a clearly identifiable focal point of responsibility for negotiations. A possible solution to the Bermuda II problem (where there were disputes over the relative ranking of members of the U.S. team and difficulty because their British counterparts outranked them all) is the establishment of a permanent position to head international transportation negotiations at either the ambassadorial or assistant secretary level within the Department of State. The person holding this position would be recognized as the focal point of U.S. negotiating efforts, avoiding disputes with the representatives of other agencies. It is highly unlikely that a person with such a position would be outranked by foreign counterparts in future negotiations[426] and the permanence of the position would help to insure consistency in U.S. efforts.

Currently the State Department has neither the technical expertise nor the resources to develop the economic data needed for meaningful negotiations to be carried out. The NTPSC alternative urges the inclusion of a DOT representative as a fully recognized member of all U.S. negotiating teams in order to insure that effects on the transportation network are understood and fully accounted for by the chief U.S. negotiator.

CONCLUSIONS

The NTPSC review of the impacts of its recommended policies indicates that substantial net benefits are expected if these policies are implemented. For the eleven goal areas, the results are as follows.

1. Adequate Service: Regulatory reform is expected to improve the price-service options available in all markets, especially the rural market. Limited, temporary subsidies may operate to perpetuate service until it can be made self supporting (e.g., rail branchlines and intercity bus service).
2. Appropriate Rates and Prices: The NTPSC policies will often result in user fees for public facilities and services that more accurately reflect the costs occasioned by various users. Regulatory reform will also serve to alter price structures of privately provided services to end cross-subsidization.
3. Economic Efficiency: User fees, proper economic analysis, and regulatory reform should all serve to enhance the ability of the private sector to compete. Where the Federal government is involved, increased concern for efficiency should provide an improved return on the use of Federal resources.
4. Energy Conservation and Development: Deregulated energy markets will provide, in the long term, proper incentives to conserve scarce petroleum resources and to develop domestic resources. In the short term, fuel economy standards will continue to encourage improved vehicle design and generation as the era of controls is phased out.
5. Environmental Protection and Enhancement: Revised government organization, cost-effective standards, and user fees that reflect external costs and benefits are all recommended by the NTPSC, and should serve to improve the effectiveness with which environmental trade-offs are made.
6. Safety: The NTPSC has recommended policies to determine new requirements for safety certification of motor carriers, new emphasis on enforcement of strict, cost-effective safety standards for all modes, and multinational negotiations to accomplish worldwide prevention of accidents and spills of hazardous materials.
7. Employment: The NTPSC has emphasized the need for renewed emphasis on total factor productivity, including that of labor and manage-

ment. Improved economic efficiency will create new employment opportunities to replace those types of jobs that may be adversely affected by certain NTPSC policies.

8. Industry Promotion and Protection: The NTPSC policies seek to make the Federal role more even-handed, so that carriers, shippers, and passengers can make informed choices in a truly competitive environment. Federal involvement should be limited to those sectors that do need Federal promotion, including research and development.

9. Regional and Urban Development: The NTPSC forecasts have shown that coal development will create needs for transportation expansion in the Northern Great Plains Region. Rail congestion and waterway bottlenecks have also been pinpointed. Federal urban transit assistance, so vital for the development of cities, will be continued in a cost-effective manner. Improved multimodal planning should serve to facilitate the development of rural areas.

10. Equity: User fees, an end to preferential Federal regulation and promotional activities, and improved coordination of specialized transit assistance to disadvantaged groups should all serve to improve the fairness of Federal policies. Economic analysis of Federal spending will serve to highlight transfers among regions, modes, and user groups, so that informed choices can be made on equity questions.

11. Defense: The Defense Department and the nation's security will gain from a more competitive commercial transport network, from improved financing prospects for new equipment, from subsidies to the maritime sector that stress cost-effective defense features, from multilateral negotiations to rationalize worldwide shipbuilding and operations through reduced subsidization and regulation, and from improved multimodal planning that directly considers defense needs.

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180. *Wall Street Journal,* 24 January 1979, p. 6. DOE believed the contracts provided prices that were too high relative to those paid for Canadian natural gas. President Carter asked that negotiations be reopened.
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191. *Ibid.,* p. IV–57. Note that March 1979 petroleum consumption was 21 million barrels per day in the U.S.
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199. *Wall Street Journal*, 1 February 1979, p. 1. Another type of motor fuel, gasohol, is being sold in at least a dozen states. It consists of nine parts unleaded regular gasoline and one part ethanol, or grain alcohol. The retail prices at the 230 Iowa stations and 40 or so Nebraska stations offering gasohol are typically 5¢ per gallon above the price of unleaded regular gasoline. See "Gasohol: Fuel for the Future," in *Consumer Reports*, April 1979, p. 195. Reportedly over 2 million gallons of gasohol were sold in Iowa alone in 1978. As a result of these sales, it is estimated that Iowa experienced a loss of state gas tax revenues of $2.2 million (while the Federal government lost $1 million), as gasohol is exempt from the Iowa and Federal motor fuel taxes. Iowa projects gasohol sales of 404 million gallons by 1983, with consequent loss of state fuel tax revenue of $40 million, and of Federal fuel tax revenue of $16 million. See American Association of State Highway and Transportation Officials (AASHTO), "Letter to Members," Washington, D.C.: 28 February 1979, pp. 1, 2.
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Estimated Range of Deaths
per 10 GWy Energy Output

Coal	50 – 1,600
Oil	10 – 1,400
Wind	120 – 230
Solar, Space Heating	80 – 90
Uranium	2.5 – 15
Natural Gas	1 – 4

The table is that of Dr. Herbert Inhaber, Associate Scientific Advisor to Canada's Atomic Energy Control Board. For a discussion of challenges to these estimates, see Suzanne Weaver, "The Passionate Risk Debate," *Wall Street Journal*, 24 April 1979, p. 24.

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212. *Ibid.*, pp. D–42 – D–44.
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215. *Ibid.*, pp. D–14 – D–15.
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217. H.R. 8729, 95th Cong., 2d sess. (1978).
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221. *Ibid.*, pp. D–9 and D–25.
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223. *Ibid.*, pp. D–9 and D–25.
224. Pub. L. 92–574, Section 6(c)(1). See, for example, Wyle Laboratories, *Community Noise Countermeasures Cost-Effectiveness Analysis*, El Segundo, Ca.: July 1975.
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228. NTPSC communication with U.S. Environmental Protection Agency, 21 June 1978.
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231. For a discussion of this issue, see David J. Stein, "Public Ownership of Rail Rights of Way, Public Financing, Private Sector Operations and the Public Interest," *Proceedings, Transportation Research Forum*, Oxford, Indiana: Richard B. Cross Co., 1977.
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233. Ibid., p. 6.
234. Ibid., p. 21.
235. The General Accounting Office (GAO) states that although MarAd was thorough in its initial verification of citizenship for the Title XI Loan Guarantee Program (46 U.S.C. Section 127 *et seq.)*, it failed to monitor the recertification required by law. See GAO, letter report to the Chairman of the Senate Committee on Government Operations (CED–77–68), Washington, D.C.: 16 May 1977. Also see U.S. GAO, *Controlling Foreign Investment in National Interest Sectors of the U.S. Economy* (ID–77–18), Washington, D.C.: 7 October 1977; and, for a description of the prevailing laws, see U.S. Department of Commerce, *Foreign Direct Investment in the U.S.*, Vol. 7, Appendix K "Federal and State Law," prepared by David Morris Phillips, Washington, D.C.: Government Printing Office, April 1976, pp. K–42 et seq.
236. U.S. Department of Transportation, *A Reexamination of the Amtrak Route Structure*, Preliminary Report to Congress

and the Public, May 1978, and Final Report, January 1979, pp. 4–10.

237. See U.S. National Transportation Policy Study Commission, Special Report No. 2, *Amtrak: An Experiment in Rail Service,* by Francis P. Mulvey, Report No. NTPSC/SR–78/02, Washington, D.C.: 1978, p. 105.

238. *Ibid.,* p. 114.

239. *Ibid.,* p. 117.

240. GAO, *Amtrak's Economic Impact,* pp. 24–27.

241. NTPSC, *Amtrak: An Experiment,* p. 61.

242. GAO, *Amtrak's Economic Impact,* pp. 24–27.

243. *Ibid.,* p. 38.

244. *Ibid.*

245. *Ibid.,* p. 42.

246. *Ibid.,* p. 38.

247. *Ibid.*

248. Passenger-mile estimates for the current and recommended systems are based on an extrapolation of the annual rates of growth through 1984 found in the DOT Final Report. These rates of growth are 0.5 and 1 percent, respectively. The 1980 passenger-mile estimate for the corridors-only system is a FY 1977 figure from the DOT Preliminary Report and is estimated here to grow after 1977 at the same 1 percent annual rate. For more detail, refer to NTPSC, *Amtrak: An Experiment.* For a recent estimate of Amtrak's relative fuel efficiency, see Congressional Budget Office, National Research and Commerce Division, "Current and Future Savings of Energy Attributable to Amtrak," Washington, D.C.: Government Printing Office, May 1979.

249. Passenger-mile estimates are the same as those explained under the energy section, footnote 248. The per-mile emissions estimates are from the NTPSC report. The report's pollutants per passenger-mile estimates for the four major pollutants are summed and applied to the DOT passenger-mile projections.

250. Passenger-mile estimates are the same as those explained under footnote 248. Fatality rates for 1975 are given in American Bus Association, *America's Number One Passenger Transportation Service,* Washington, D.C.: 1978.

251. DOT, *Trends and Choices,* p. 106.

252. NTPSC computations.

253. DOT, *A Reexamination of the Amtrak Route Structure,* p. D–7.

254. NTPSC, *Amtrak: An Experiment,* p. 89.

255. *Ibid.,* p. 83.

256. NTPSC, *A Compendium,* p. C–310.

257. U.S. Interstate Commerce Commission, Bureau of Economics, *The Intercity Bus Industry: A Preliminary Study,* Washington, D.C.: Government Printing Office, 1978, p. 11.

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Staging Policy Changes

15

THE IMPORTANCE OF FORMAL AND INFORMAL IMPLEMENTATION MECHANISMS

The legislation establishing the National Transportation Policy Study Commission stated the aspects of transportation and energy to be studied and when the final report was to be submitted to Congress and the President. It explicitly required the cooperation of Federal agencies in performing research and preparing the report.[1] However, the legislation was silent on what should occur after submission of the report. The NTPSC is authorized to continue operations only for up to six months after producing its final report.

In the simplest sense the transportation policy recommendations of the NTPSC can be implemented through the usual formal mechanisms of legislation or actions by the executive branch or the independent regulatory commissions. The NTPSC itself was not created to be a policy-implementing organization. Yet, it is not accurate to state that the NTPSC final report must stand or fall by itself. In fact, the NTPSC process of studying transport policy may have served to create constituencies for implementation of some of the policy recommendations. This is true for several reasons.

First, the NTPSC held public hearings. The information presented became available for others to consider, as well as being used by the NTPSC to further its policy investigations. Second, the NTPSC sponsored research by its staff and by consultants as part of its workplan. The results of this research are documented in a series of special reports and staff working papers and were used to produce the NTPSC final report. Third, the process of producing these NTPSC reports stimulated further research and policy debate by those involved. For example, during 1978, NTPSC staff worked with over 50 nationally known transportation researchers to devise policy alternatives and to investigate their impacts. Although many of the alternatives were not recommended by the NTPSC, the policy development sessions were productive for those involved, and many of the ideas developed by these teams undoubtedly will be explored in further research over the years. Fourth, the NTPSC's published special reports themselves have received public attention, and comments about these NTPSC reports may, in turn, stimulate additional research and more informed debate.

One result of the NTPSC policy research has been to document the finding that policy is set at many levels by many participants, and is constantly changing. Therefore, to understand policy, one must look beyond formal statements in legislation or executive rulemaking, to the *proposals* for policy and the debate that occurs behind the scenes. Consideration of these less formal policy mechanisms provides a clearer picture of policy as it is in practice, rather than policy as it appears, or as it is supposed to be. Thus, implementation of the NTPSC policy recommendations can proceed not only through enactment of legislation, but also through the development of legislative proposals and hearings on these proposals. Implementation will proceed not only through Executive Orders by the President, the formal rulemaking of executive agencies, or formal findings following *ex parte* proceedings by regulatory commissions, but also through informal statements of policymakers, subsequent research to refute or support NTPSC findings, and actions by the private sector to bring NTPSC findings to the attention of policymakers.

In order to bring NTPSC policy proposals to the stage of formal implementation through congressional or executive action, constituencies for change must develop. The NTPSC research process, its report, and its commissioners and staff are all part of a constituency-building process. Policy changes that affect U.S. transportation can result from the process of constituency building, even if formal policy declarations are not immediately adopted by Congress or the President. Important policy changes can occur gradually and almost invisibly, with a cumulative effect that is substantial.

EXAMPLES OF COALITIONS FOR CHANGE

When Congress acted in 1978 to deregulate domestic air passenger service,[2] a widespread coalition of forces worked for change. Among the members of the Ad Hoc Committee for Airline Regulatory Reform were several trunk and commuter airlines, as well as representatives of passengers and government agencies. Relatively few air carriers exist, and the regulation-induced service competition that had eroded profits and resulted in half-empty airplanes was highly visible.[3] In Congress, Senators Cannon and Kennedy cooperated to sponsor a deregulatory bill that addressed both air transportation and antitrust matters, thereby jointly considering the measure in their respective subcommittees of the Commerce and Judiciary Committees.

For rail regulatory reform, again a broad-based coalition has emerged. The "strong" western and southern railroads support the concept, as does Conrail. In fact, Conrail and the bankrupt and financially troubled railroads of the East and Midwest are quite visible symbols of the need for reform. Conrail officers argue that their firm cannot meet congressional goals of ultimate profitability without substantially increased pricing and route freedom.[4] Shippers and government officials join in arguing for pricing flexibility that would permit railroads to retain market shares of bulk commodities facing competition from water, pipeline or trucking modes.

In the case of regulatory reform for trucking, there is no such broad coalition for reform. Virtually no common carrier trucking firms support substantive deregulation.[5] Further, the National Industrial Traffic League, a major shipper organization, has opposed drastic changes to antitrust immunity for motor carrier rate bureaus.[6] Within Congress there is conflict. Senators Cannon and Kennedy both sought to win jurisdiction over reform legislation that would end antitrust immunity for motor carrier and freight forwarder rate bureau activities.[7]

In addition, there are thousands of separate trucking firms. The ICC does not even maintain records as to which regulated carriers serve which markets. Exact details of carrier costs are unknown except to the carriers and their rate bureaus. Major trucking firm bankruptcies are few; trucking service is generally rated good by those who use it.[8] Thus, the costs of trucking regulation are not directly visible, being manifest only indirectly through reduced railroad earnings or excess trucking capacity, despite instances of monopoly trucking returns. The benefits of deregulation are equally dispersed (but real, according to NTPSC research, especially with attention paid to ensure safety).

Therefore, to implement the NTPSC recommendations for significant reform of motor-carrier economic regulation, much work remains to be done to determine the amounts and incidence of benefits and costs. The results must then be disseminated as part of the process of forming broad-based coalitions to work for implementation.

The rest of this chapter further develops concepts of formal and informal policy implementation. The specific NTPSC recommendations are listed below, together with one of the many alternatives for staging their implementation. The reasons for proposing this implementation strategy are developed in subsequent sections. For example, a review of earlier national studies is given, to highlight some of the factors that contributed to significant policy recommendations. For successful implementation of transportation policy, a constituency must be established to work for adoption of the policy through formal or informal channels. Sometimes skillful compromises must be determined. An important component of successful implementation is the continuing evaluation and adjustment of the policies, to be certain that policy impacts are in reality as they were predicted to be. These processes of building constituencies, winning adoption of policies through compromise, and continuing to monitor progress are described in subsequent sections.

In the bibliography, several references are provided for those interested in reading more about theories of implementing policies and programs in the context of multi-level government bureaucracies, from the points of view of social scientists.

There are no simple ways to guarantee the successful implementation of meaningful transport policy recommendations. This chapter stresses the need to combine the "art" of implementation, based on forging coalitions of support within shifting political alliances, with the "science" of sound research, based on rational methods and reliable data.

STAGING THE NTPSC POLICY RECOMMENDATIONS

Table 128 shows each of the NTPSC policy recommendations with an indication of *one* action that might be undertaken to accomplish implementation of that policy. In many cases, more than one method could be pursued to implement the policy (and other methods were considered by the NTPSC). Nonetheless, only one implementation example is given for each policy, to restrict the table to manageable proportions.

Table 129 contains a chronological presentation of the actions required to implement the NTPSC policy recommendations, shown in the context of status quo policies and programs that are now scheduled for implementation. The two tables illustrate the principle that not all of the NTPSC recommendations should be implemented immediately by Congress, the executive branch, or independent regulatory commissions. In many cases, as existing programs come due for renewal, Congress can act to implement the new NTPSC proposals so as to

TABLE 128. NTPSC policy implementation actions

NTPSC POLICY RECOMMENDATION	*POSSIBLE ACTIONS REQUIRED*
REGULATION	
I. *ECONOMIC*	
Continue regulatory reform. A residual regulatory agency should administer fitness regulations. Agencies should determine the costs and benefits of existing and proposed regulations before implementation.	Administrative actions to implement major transportation regulatory changes should be guided by an overall plan such as proposed in Section 4(a)(2) of S. 445 (96th Cong., 1st sess.). A policy such as Section 4(a)(2) should be implemented immediately by Executive Order, changing the completion date to December 1979. This plan should be continually updated and integrated with legislative activity involving major regulatory change. Congress should enact a coordinated set of regulatory reform measures in 1980, to phase in all of the reforms by 1985. Benefit/cost analyses should be executed, first for all *new* regulations by the promulgating agency starting in 1979. Agencies should next initiate similar analyses for *existing* regulations and should regularly synthesize and report their findings.
A. *Common Carrier Obligation*	
Carrier obligation should be retained but carriers should be assured an adequate return on uneconomic obligated routes. Fitness, safety, and insurance rules should be continued and strengthened.	The recommended language should be incorporated into the current statement of national transportation policy (49 U.S.C. Section 10101) as part of the 1980 legislation to create the residual regulatory commission.
B. *Entry-Exit-Route Restrictions*	
A new residual transportation regulatory commission would grant certificates to for-hire carriers based on fitness (including that required by insurance regulations) and safety. For motor carriers, adequate insurance (or proof of financial responsibility equal to that required by insurance regulations) should be a minimum of $1 million for single occurrence, or an amount sufficient to require periodic "on site" inspection, updated regularly. Phase in entry-exit freedom for all for-hire carriers including automatic entry for an abandoned market or where dormant rights exist. Allow exit in cases of inadequate return and expedite abandonment proceedings. The DOT role should be one of coordination and provision of temporary subsidy. If carriers are required to operate at a loss, they should be compensated. Multilateral negotiations to rationalize the international maritime market should be conducted.	The recommended certification criteria should be initiated with the phasing out by 1985 of entry, exit, and route restrictions under legislation introduced in 1980 to create the residual regulatory commission. Automatic entry to serve an effectively abandoned market should be initiated through *ex parte* proceedings in 1979 by the ICC and incorporated into the legislation creating the residual regulatory commission. Preliminary guidelines for analysis of entry and exit should be developed by the ICC by October 1979. Similar analytical guidelines should be incorporated into OMB Circular A–95 so that the effects of local regulatory actions can be considered. Temporary subsidies should come from existing programs, such as the local rail service subsidy continuation begun under Section 803 of the 4R Act (Pub. L. 94–210). Congress, in 1980, should establish its intent to pursue multilateral negotiations to rationalize the international market and to reduce competitive subsidies. The State Department should head the U.S. negotiation team.
C. *Rates*	
Congress should establish expanding no-suspension rate zones, eventually achieving complete rate flexibility. A residual regulatory commission could suspend rates outside the zone that were found to be predatory, preferential, or discriminatory, while antitrust laws would apply to prices within the zone.	Changes in rate regulation should be a major focus of the legislation creating the residual regulatory commission. The legislation might allow the expanding zone of reasonableness to result in complete decontrol by 1985.
D. *Rate Bureaus*	
Rate bureau procedures need to be made more responsive to shippers, carriers and the public.	Voting procedures and greater public access should be implemented as soon as possible through *ex parte* proceedings by the regulatory commissions. Federal regulatory powers over rate bureaus in the future should be made explicit in the legislation creating the residual regulatory commission.

TABLE 128. NTPSC policy implementation actions—Continued

NTPSC POLICY RECOMMENDATION	*POSSIBLE ACTIONS REQUIRED*
REGULATION	
E. *Quality of Service*	
The responsibility of ensuring quality service should fall on those involved—e.g., users, beneficiaries, state and local governments—rather than on the Federal government. The Federal government should not apply service standards unless it is necessary to achieve the national interest. Additional costs incurred should be paid by the appropriate Federal agency.	Existing transportation regulatory commissions should initiate *ex parte* proceedings immediately to identify and reduce all quality-of-service regulations where costs exceed benefits. The legislation which creates the residual regulatory commission should explicitly preclude it from regulating quality of service unless necessary to achieve the national interest, and should transfer the ICC's Office of Rail Public Counsel (49 U.S.C. Sections 10381 to 10388) and similar organizations to the Federal Trade Commission, the Department of Justice, or similar executive agency. The legislation should also preclude the Federal government from placing any quality-of-service requirement on a private or non-Federal public carrier unless health, safety, Constitutional rights, or the transport of Federal personnel or property are involved, and then only if added costs are made explicit, financed as a separate line item, and the carriers involved are compensated.
F. *Intermodalism*	
Eliminate Federal regulatory impediments to common ownership and intermodal coordination and cooperation. Promote effective joint rates and through service within and among modes. Encourage the private sector to adopt new technology and innovative approaches to intermodalism.	Congress should act to remove Federal regulatory impediments to common ownership and intermodal coordination as part of its action to create a residual transportation commission. The residual commission should promote and encourage joint rates and through service. DOT's Research and Special Administration, as part of its annual report to Congress, should indicate progress made in promoting new technology.
G. *Mergers-Bankruptcy-Financial*	
The Federal government should permit mergers, consolidations, and transfers between carriers and among modes in an effort to increase transportation efficiency. Mergers should be subject to antitrust concepts. Subject regulated carriers to the same financial regulations as those of other sectors.	Legislation creating the residual regulatory commission should transfer functions of the Interstate Commerce Commission under 49 U.S.C. Sections 11301 to 11367 to the Federal Trade Commission, the Department of Justice, and/or the Securities and Exchange Commission, retaining only those powers necessary to determine financial fitness. Parallel provisions for aviation and maritime transport should be included.
II. *OTHER REGULATION*	
A. *Truck Size and Weight*	
States should retain their rights to set standards, but DOT should investigate benefits and costs of uniformity versus varying weight and length limits.	Such a study is required by Section 161 of Pub. L. 95–599, and is due from the Secretary of Transportation in January 1981.
B. *Labor and Management*	
DOT and DOL should encourage improved labor and management relations and productivity.	As an example, the successful St. Louis demonstration project, which included labor unions, rail associations, individual railroads, and the Federal Railroad Administration, should be repeated elsewhere and for other modes. (This project improved labor-management relations while increasing productivity.)

TABLE 128. NTPSC policy implementation actions—Continued

NTPSC POLICY RECOMMENDATION	*POSSIBLE ACTIONS REQUIRED*
REGULATION	
C. *Safety*	
Increased cost-effective Federal preventive measures such as better standards, enforcement of those standards, incentives, and increased penalties are needed. If Federal aids are necessary to achieve a better level of safety, users, carriers, state and local governments, and others must share the expense. Additional coordination between these groups will be needed to solve insurance problems relating to safety. DOT should be responsible for all aspects of transportation safety and enforcement, although for-hire motor carriers must certify they are meeting new standards (including insurance) to the residual regulatory commission. Safety standards should be strictly enforced by the Coast Guard.	The Federal Emergency Management Agency and DOT's Materials Transport Bureau should work with the transport industry to establish joint guidelines in 1979 for local preparedness in the event of a transportation-related emergency (e.g., a tank car derailment involving toxic gases). The agencies should also jointly prepare a program to start in FY 1981 for local planning, training, and coordination of organizations to deal with such localized disasters. The Office of the Secretary of Transportation should be identified by Executive Order in 1979 as the lead agency for coordinating transportation-related safety regulations and procedures promulgated by DOT's administrations, the Departments of Commerce and Defense, the Federal Emergency Management Agency, the Consumer Product Safety Commission, and the Occupational Health and Safety Administration. This function should be reinforced with a congressional mandate in 1980, which would also require the National Transportation Safety Board to continually evaluate and annually report on the state of programs coordinated by OST, on the effectiveness of OST's coordination, and on recommended changes in safety regulation involving transportation. Recommendations should emphasize the most cost-effective strategies for improving safety. Legislation creating the residual regulatory commission should transfer any remaining safety regulations by the ICC, CAB, and FMC to appropriate branches of DOT. U.S. Coast Guard rulemaking to implement pollution standards should continue. Also congressional resolutions should encourage multilateral negotiations leading to new treaties to reduce pollution.
D. *Energy*	
Free energy markets should provide proper incentives to carriers and users to use fuel-efficient vehicles and practices. Retain fuel efficiency standards until such free energy markets can be achieved.	Petroleum price controls should be removed according to the schedule established by the current executive and congressional policy. Legislation in 1980 should phase out certain economic regulatory powers of the Federal Energy Regulatory Commission, except those which involve health or safety, by 1985.
E. *Environment*	
When environmental requirements are necessary, permit prices to recover the increased cost. The Federal government should coordinate all its environmental regulations, facilitate information exchange, act as mediator during interstate disputes, and plan for catastrophes.	The Council on Environmental Quality should be empowered by Executive Order in 1979 to assume an environmental clearinghouse function, particularly to inventory all environmental data collection and dissemination activities, and annually report on gaps, conflicts, and redundancies to the President and the Congress. DOT should then report such transportation-related information to CEQ. The Council on Environmental Quality, the Environmental Protection Agency, the Department of the Interior, the U.S. Army Corps of Engineers, and other such agencies would be required by Executive Order to inform the Secretary of Transportation of any proposed regulation which might affect transportation directly or indirectly.

TABLE 128. NTPSC policy implementation actions—Continued

NTPSC POLICY RECOMMENDATION	*POSSIBLE ACTIONS REQUIRED*
OWNERSHIP AND OPERATIONS	
Federal funding and regulation should encourage continued private ownership of transportation services and facilities to the greatest extent possible. All alternative measures to Federal ownership should be explored before choosing greater Federal involvement. When Federal assistance is necessary it should often be a user subsidy. However, most existing cases of Federal ownership should be continued. Locate Federal facilities along existing common carrier routes where feasible. In the case of Amtrak, allow Amtrak management more freedom to manage effectively according to cost-effective policies.	The Secretary of Transportation and the ICC's Rail Services Planning Office should initiate studies of additional methods, including further route restructuring, to make Amtrak more cost-effective. Preliminary reports should be completed by January 1980. The Comptroller General should also obtain comments and rebuttals by the agencies and Amtrak, and publish its final report by April 1980, when Congress should consider reduced, but longer-term authorizations for intercity rail passenger service. The President should require the GSA and Federal Emergency Management Agency to publish, by June 1980, a report prepared in cooperation with DOT, the Department of Defense, and the U.S. Postal Service, containing: (1) A summary of all vehicles and transportation facilities owned or used by the Federal government; (2) The potential uses of those vehicles and facilities during and after each possible natural or other disaster; (3) The existing and future readiness for and impediments to such uses; (4) Alternative approaches to improving readiness and removing impediments; (5) Costs and benefits of each alternative; and (6) Recommendations for Executive Orders and specific legislation. The implementing legislation should be introduced after September 1980. The Office of the Secretary of Transportation should initiate a study on the effects of UMTA and HEW policies and programs on local passenger service provided by the private sector, and develop and evaluate alternative executive and legislative actions for increasing private sector participation when cost-effective. Findings and recommendations should be submitted to the President and the Congress by June 1980. The Office of Management and Budget should amend its Circular A–95 in 1979 to include consideration of the private sector's ability to meet the transportation needs of social service agencies' clients. The Secretary of Transportation should be able to grant exemptions to this rule for flexibility. Once an area for a new Federal facility is chosen, the General Services Administration should be required immediately by Executive Order to locate Federal facilities and services on common carrier passenger and freight routes which have frequent enough service to give adequate access for users and employees, and to provide necessary logistics support. This rule should be relaxed only for environmental, defense, safety, or other overriding considerations, following an analysis of cost-effectiveness.
FINANCE, PRICING AND TAXATION A. *Overall*	
The Federal government needs clearly to identify its transportation and non-transportation objectives to be used as criteria for providing assistance. Federal assistance should be justified by economic analysis. Any assistance should be flexible, predictable, and cost-effective. User charges should reflect the cost of use and the benefits derived.	Legislation should be introduced in 1979 to amend the DOT Act (Pub. L. 89–670) to add the requirement that the Secretary of Transportation should submit to Congress every two years reports on the performance of the U.S. transportation system, and on policies required to meet the needs of the system in a cost-effective manner.

TABLE 128. NTPSC policy implementation actions—Continued

NTPSC POLICY RECOMMENDATION	*POSSIBLE ACTIONS REQUIRED*
FINANCE, PRICING AND TAXATION	
	The legislation which creates the residual regulatory commission and which amends the DOT Act should add the following: "Users of public transportation facilities and services should be assessed charges that reflect the costs occasioned by their use, while considering the benefits derived by nonusers."
B. *Economic Analysis and Evaluation* Each Federal agency should specify objectives for congressional approval. Economic analysis should be required for all major Federal policies, programs and regulations. For all alternatives, including "do-nothing," determine the costs, benefits, impacts on other goals and markets, and appropriate sunset requirements.	The legislation which amends the DOT Act should also require that all future Federal legislation which establishes transportation or transportation-related policies and programs should include objectives, and should be subject to proper economic analysis.
C. *Expenditures* Federal subsidies should be conditioned on discounted benefits exceeding costs. Amtrak subsidies should be reduced and the air subsidy program phased out. The use of investment analysis, and the transferability of funds should be encouraged. Subsidies should be temporary, yet predictable. ODS and CDS eligibility requirements should be more explicit. Subsidies should be provided largely for ships that fulfill a defense need, and made subject to performance standards.	Legislation in 1979 and 1980 is needed. The FY 1980 Amtrak authorization bill should cover at least 4 years and reflect decreased subsidy levels. The Secretary of Transportation should monitor and evaluate the effects of the phasing out of air subsidies under Pub. L. 95–504 in 1985–86, and recommend any actions to Congress deemed necessary to maintain service to small communities before that time. The President should require the development of performance standards for ODS and CDS, stressing national defense. The Assistant Secretary of Commerce for Maritime Affairs should submit this statement by December 1979, in cooperation with DOT, to facilitate early congressional consideration.
D. *Trust Funds* Retain current modal trust funds and study an urban transportation trust fund.	The next Federal-Aid Highway Act (c. 1980) should amend the Internal Revenue Code of 1954 by striking out "1984" in each place it appears as listed in the Highway Revenue Act of 1978 (Title V of Pub. L. 95–599), and inserting in lieu thereof "until repealed." Similar action should be taken for the Airport and Airway Trust Fund (Pub. L. 91–258) in 1980. In order to initiate appropriate study and debate, the President should propose the creation of an urban transit trust fund in his State of the Union address in January 1980, and send draft legislation to Congress shortly thereafter, to be considered together with the other trust fund measures.
E. *User Fees and Taxation* User fees should recover costs. Allow user charges (tolls) on certain new or upgraded Federal-aid facilities. Eventually, Conrail should be on a pay-as-you-go basis. Encourage states or local governments to equalize taxation of rights-of-way so as not to favor any one mode. All transportation projects should encourage user fees as a means of recovering costs.	The next Federal-Aid Highway Act (c. 1980) should repeal 23 U.S.C. Section 301 (prohibition on tolls). An organization such as the Advisory Commission on Intergovernmental Relations should be commissioned to undertake a study to determine the equity among modes of property taxation on transportation rights-of-way, and report its findings to Congress and the President by December 1980. The Secretary of Transportation should undertake a study to determine the feasibility, consequences, and appropriateness of applying direct user fees to all forms of transportation, and report its findings by December 1980. The Advisory Commission on Intergovernmental Relations, the General Accounting Office, and the Transportation Research Board should undertake independent reviews and validation of any findings and recommendations, and the combined reports and rebuttals should be published by June 1981.

TABLE 128. NTPSC policy implementation actions—Continued

NTPSC POLICY RECOMMENDATION	*POSSIBLE ACTIONS REQUIRED*
PLANNING AND INFORMATION	
A. *Planning*	
State and local multimodal planning should be encouraged with appropriate consideration of local conditions, the private sector, and non-transportation objectives. The Federal government should make its transportation objectives clear and the DOT should present guidelines rather than strict requirements. Recipients should be free to use any portion of Federal grants for planning. The U.S. should use multilateral mechanisms to help resolve the issue of excess ship capacity.	The legislation which amends the DOT Act in 1979 should require the Secretary of Transportation to implement these requirements. Constraints on planning grants should be removed in the next Federal-Aid Highway Act (c. 1980) by amending 23 U.S.C. Section 307(c) as follows: — In subsection (1), "Not to exceed 1 1/2" should be replaced by "Any." — Subsection (2) should be repealed and subsequent sections renumbered.
B. *Information*	
Reporting requirements should be minimized and be directly related to program objectives. The concept of a national transportation data center should be explored.	Legislation amending the DOT Act in 1981 should include a new section creating a National Center for Transportation Data to gather and disseminate both statistical and bibliographic information. The legislation creating the Center should also give the General Accounting Office the same authority it has in the energy field (under 42 U.S.C. Sections 6381 to 6384) to validate transportation data and evaluate information systems. This authority should apply to all information required by transportation and transportation-related agencies of the Federal government. Legislation should be introduced in 1981 to transform the current Census of Transportation under 13 U.S.C. Section 131 from a series of limited surveys to a census which would provide comprehensive data.
C. *Research*	
Increased Federal funding for research is recommended, where benefits may exceed costs. The private sector should be actively involved.	DOT's Research and Special Programs Administration should be designated in 1979 by Executive Order as the coordinator of all federally funded transportation research and development programs. The Administrator should report all conflicts and redundancies in transportation research throughout the Federal government to the Secretary of Transportation, and should annually report to Congress and the President on the current progress, prospects, and problems of that research. Legislation in 1980 should increase funds available for research. The Research and Special Programs Administrator should establish by regulation a minimum set of evaluation questions and methods to be applied to all transportation service demonstration projects and experiments, to take effect in FY 1980.
GOVERNMENT ORGANIZATION	
The Federal government should be reorganized so that the transportation policies and programs of each agency are coordinated. A single residual regulatory agency should replace the CAB, ICC, and FMC. Each House of Congress should study its committee structure.	Improved agency coordination will be achieved in part by the legislation introduced in 1979 to amend the DOT Act, in part by the legislation introduced in 1980 to create the residual regulatory commission from the CAB, FMC, and the ICC, and in part by the executive designation of the Office of the Secretary of Transportation as the lead agency for transportation matters, including safety regulation.

TABLE 129. Schedule for implementation of existing and NTPSC-proposed policy recommendations

Calendar Years	Policies
1979	*STATUS QUO*
	Mandatory average fuel economy standard established by Congress for passenger automobiles in 1979 model year is 19.0 mpg (Pub. L. 94–163).
	Implementation or veto of Amtrak restructuring proposal (Pub. L. 95–421).
	White House task group on maritime policy to submit recommendations to the President.
	Seat belt study completed by DOT and NAS (Pub. L. 95–599).
	NTPSC
	Amend DOT Act (Pub. L. 89–670) to require DOT to submit to Congress every two years reports on the performance of the U.S. transportation system, and on policies required to meet the needs of the system in a cost-effective manner. The use of user fees and of proper economic analysis should be encouraged. New planning guidelines would be initiated.
	By executive order require an executive regulatory reform plan, to be implemented by legislation in the following year (similar to section 4(a)(2) of S.495 of the 96th Congress, 1st session).
	By *ex parte* proceedings the ICC should establish the policy to permit automatic entry in any effectively abandoned market. Also, regulatory agencies should reform rate bureau practices. Regulations that are not cost-effective should be ended.
	Amend OMB Circular A–95 to stress consideration of state and local regulatory impacts on federally-funded projects, and to enhance the role of the private sector.
	Legislation to eliminate Federal regulatory impediments to common ownership and intermodal coordination and cooperation should be enacted.
	Implement the findings of the St. Louis rail productivity demonstration as widely as is cost-beneficial, and begin new demonstrations where needed.
	By executive order, require DOT to establish cost-effective health and safety-related transportation regulations.
	Phase out energy controls according to the schedule established by Congress and the President, while retaining fuel efficiency standards through 1986.
	DOT should report to Congress on its efforts to improve the use of the private sector in its programs.
	Establish DOT's Research and Special Programs Administration as the coordinating agency for Federal transportation-related research and development.
1980	*STATUS QUO*
	Airport Trust Fund expires (Pub. L. 91–258).
	Fuel tax for commercial transportation on inland waterways is begun at 4¢ per gallon (Pub. L. 95–502).
1980	*STATUS QUO*
	Mandatory average fuel economy standard established by Congress for passenger automobiles in 1981 model year is 20.0 mpg (Pub. L. 94–163).
	Census of Population and Housing including journey-to-work questions (13 U.S.C. Section 4 *et seq.*).
	DOT to submit recommendations to Congress for payment of debt service in order to make toll roads incorporated in interstate system free to public travel (Pub. L. 95–599).
	End of taxicab exemption from certain fuel taxes (Pub. L. 95–599).
	Urban blight study submitted by DOT (Pub. L. 95–599).
	National Alcohol Fuels Commission submits final report (Pub. L. 95–599).
	Gas guzzler tax begins ($200 on autos achieving under 12.5 mpg) (Pub. L. 95–618).
	Revenue Sharing Program expires (31 U.S.C. Sections 1221–1263).
	NTPSC
	Amend IC Act at 49 U.S.C. Section 10101 *et seq.* to:
	Redefine common carrier obligation. Establish expanding rate zones of reasonableness to result in pricing freedom by 1985. Condition the right of motor carriers to operate upon demonstration of adequate insurance (or proof of financial responsibility equal that required by insurance regulations)—covering public liability, property damage, cargo (for other than private carriers), and environmental restoration—and demonstration of payment of the Federal heavy vehicle use tax. For certificated motor carriers, a minimum of $1 million of insurance, or an amount sufficient to require periodic on site inspection, updated regularly, is needed.
	Reform rate bureau policies. Transfer certain financial and antitrust regulatory responsibilities to other agencies (e.g. FTC, DOJ, or SEC). Encourage the use of user fees and proper economic analysis.
	Enact new legislation to create a residual regulatory agency (to combine certain functions of the CAB, ICC, and FMC). Transfer quality-of-service provisions to FTC, DOT, or similar agencies.
	Congress should pass a resolution stating its desire to pursue multilateral treaties to rationalize shipping capacity, to reduce competitive subsidization, and to enact strict anti-pollution standards relying on free market incentives to the greatest extent possible.
	Amend the DOT Act (Pub. L. 89–670) to reinforce DOT as the lead agency in transportation matters, specifically including the promulgation and enforcement of health and safety regulations.

TABLE 129. Schedule for implementation of existing and NTPSC-proposed policy recommendations —Continued

Calendar Years	Policies
1980	*NTPSC*
	Congress should consider a DOT study on cost-effective ways to improve Amtrak performance (in addition to route restructuring), and should act to provide long-term financing to Amtrak that provides management flexibility with strict accountability to performance standards and to reduced subsidy levels.
	GSA and FEMA should report to Congress on federally owned vehicles and facilities. Legislation should follow to improve coordination after the development of performance standards by MarAd, in cooperation with DOT. Legislation is needed to implement the performance measures required of ODS and CDS recipients.
	Enact a Federal-Aid Highway Act of 1980 to repeal the prohibition on tolls (at 23 U.S.C. Section 301) and to remove constraints of planning grants (at 23 U.S.C. Section 307(c)) and amend the Internal Revenue Act of 1954 to permanently authorize the Highway Trust Fund. Similar legislation should be enacted for the Airport and Airways Trust Fund. The creation of an urban transportation trust fund should be considered by Congress at this time.
	Report by an agency such as the Advisory Commission on Intergovernmental Relations on the equity of state and local property taxation among modes is due.
	DOT studies on the equity and efficiency of user fees for all modes, using the findings of ongoing studies such as that for the inland waterway mode, would be completed by the end of the year. Public comments would follow for a year after which legislation would be expected.
1981	*STATUS QUO*
	Original Conrail funding expires (Pub. L. 94–210).
	DOT to submit to Congress a study on vehicle size and weight limits (Pub. L. 95–599).
	Northeast Corridor Project to be completed (Pub. L. 94–210).
	Fuel tax for commercial transportation on inland waterways is 6¢ per gallon (Pub. L. 95–502).
	Mandatory average fuel economy standard established by DOT for passenger automobiles in 1981 model year is 22 mpg (Pub. L. 94–163).
	Completion of restricted access demonstration project by DOT (Pub. L. 95–599).
	DOT/DOC inland waterways user charges study completed (Pub. L. 95–502).
	Maximum light-duty vehicle emissions for 1981 and beyond—.41 grams/mile hydrocarbons, 3.4 grams/mile carbon monoxide, and 1.0 grams/mile nitrogen oxides (Pub. L. 95–95).
	NTPSC
	Apply results of truck size and weight study to the issue of whether or not uniform state standards are needed (Pub. L. 95–599, Section 161).
1981	*NTPSC*
	Amend the DOT Act (Pub. L. 89–670) to create a new National Center for Transportation Data under the auspices of DOT. Also, legislation should revise Census Bureau procedures to encourage comprehensive data collection (13 U.S.C. Section 131).
1982	*STATUS QUO*
	Supplemental $1.2 billion Conrail authorization expires (Pub. L. 95–565).
	Authority of the CAB over interstate and overseas route certification terminates. Authority for overseas routes transferred to DOT (Pub. L. 95–504).
	Passive restraints required in automobiles but use of Federal funds to implement the rule is banned (Pub. L. 95–355).
	Mandatory average fuel economy standard established by DOT for passenger automobiles in 1982 model year is 24 mpg (Pub. L. 94–163).
	Census of Transportation (13 U.S.C. Section 131).
	Ambient air quality standards must be met by most regions. Five year extensions granted only to regions which have established effective planning processes (42 U.S.C. Section 1857 *et seq.*).
	Truck noise standard of 80 dB(A) at low-speed, wide-open throttle for vehicles built after January 1 (40 C.F.R. 202).
	Final reports due from DOT on highway cost allocation and highway trust fund excise tax structures (Pub. L. 95–599).
1983	*STATUS QUO*
	Highway and urban transit authorizations expire (Pub. L. 95–599). (NTPSC recommends permanent highway authorization in 1980 and continuing transit authorizations.)
	Fuel tax for commercial transportation on inland waterways becomes 8¢ per gallon (Pub. L. 95–502).
	CAB authority over passenger air carrier rates terminates (Pub. L. 95–502).
	Mandatory average fuel economy standard established by DOT for passenger automobiles in 1983 model year is 26 mpg (Pub. L. 94–163).
	Final year to make changes in planned Interstate Highway segments (Pub. L. 95–599).
	Aircraft Loan Guarantee Program expires (Pub. L. 95–504).
	States in which more than 30% of the drivers exceed the 55 mph speed limit lose up to 10% of allocated Federal highway funds (23 U.S.C. Section 154).
	Strict construction, crew training, and navigation/communication aids standards, including segregated ballast and gas inerting systems, must be met by all tankers of 20,000 tons or more in U.S. waters (Pub. L. 95–474).
1984	*STATUS QUO*
	Highway Trust Fund expires (Pub. L. 95–599). (NTPSC recommends permanent authorization in 1980.)

TABLE 129. Schedule for implementation of existing and NTPSC-proposed policy recommendations —Continued

Calendar Years	Policies
1984	*STATUS QUO*
	Mandatory average fuel economy standard established by DOT for passenger automobiles in 1984 model year is 27 mpg (Pub. L. 95–163).
1985	*STATUS QUO*
	Price controls on new natural gas lifted (Pub. L. 95–621).
	CAB expires (Pub. L. 95–504).
	Fuel tax for commercial transportation on inland waterways becomes 10¢ per gallon (Pub. L. 95–502).
	Mandatory average fuel economy standard established by Congress for 1985 model year is 27.5 mpg (Pub. L. 94–163).
	Original goal of Federal Water Pollution Control Act is to eliminate discharge of pollutants into navigable waters (Pub. L. 92–500).
	All subsonic jet airplanes with maximum gross takeoff weights in excess of 75,000 pounds which do not meet Federal Aviation Regulation 36 noise standards must be retired from the fleet (F.A.R. 36).
	NTPSC
	Regulatory reforms established by earlier legislation have taken effect.
1986	*STATUS QUO*
	All routes and projects not under contract on the Interstate Highway System are dropped from the system (Pub. L. 95–599).
1986	*STATUS QUO*
	New cars having fuel economy of less than 12.5 mpg are taxed at a rate of $3,850 per vehicle (Pub. L. 95–618).
	All air subsidies for mail service ended (Pub. L. 95–504).
1987	*STATUS QUO*
	Census of Transportation (13 U.S.C. Section 131).
	Ambient air quality standards must be met by all regions (42 U.S.C. Section 1857 *et seq.*).
1988	*STATUS QUO*
	Essential Service Small Community Air Subsidy ends (Pub. L. 95–504).
1989	
1990	*STATUS QUO*
	Completion of the Interstate system (Pub. L. 95–599).
	Census of Population and Housing, including journey-to-work questions (13 U.S.C. Section 4 *et seq.*).
2000	*STATUS QUO*
	Census of Population and Housing, including journey-to-work questions (13 U.S.C. Section 4 *et seq.*).
	Panama Canal turned over to the Panamanian Government (Congress must act).

accomplish a smooth transition. For example, transit programs would be reauthorized by Congress, with the modifications proposed by the NTPSC, as the existing authorizations expire.

On the other hand, many of the NTPSC proposals do involve major new policy directions. Often, these should be implemented immediately as an integrated set (not piecemeal), so as to establish the proper atmosphere for the detailed policy changes that would be made in the future. For example, actions to deregulate transportation might not yield beneficial results unless the policy of establishing proper user fees is also adopted. That is, immediate commitment in principle to the implementation of the NTPSC policy recommendations is highly desirable, even though formal actions on some of the individual policies can only be accomplished gradually.

Although desirable, expecting such immediate and total commitment to the NTPSC policy proposals is unrealistic. This is because the process of gradual implementation of the recommendations will itself serve to create constituencies that will support further changes.

Another reason to support gradual implementation of the NTPSC recommendations is that the NTPSC forecasts are not infallible. Expectations of future trends may turn out to be unrealistic. Thus, certain of the NTPSC policy proposals may require modification based on future events. A carefully staged process of implementation can permit such adjustments to occur as they are needed.

To summarize, Tables 128 and 129 illustrate only one of several possible sequences of implementation of the NTPSC policy recommendations. Other sequences might be almost as productive. Despite listing individual policy recommendations together with individual methods of implementation, the NTPSC emphasis is on implementing its entire set of recommendations in a carefully staged manner. Basically, the tables show that two major sets of legislation are required. One, to be enacted as soon as possible (1979), would amend the DOT Act (Pub. L. 89–670) to establish clearly that agency as the lead transportation promotional agency within the Federal government. The second, to be enacted in 1980, would amend the Interstate Commerce Act (49

U.S.C. Section 10101 (1978)) to establish revisions to the national transportation policy, and would amend and enact other provisions to implement the NTPSC regulatory policy recommendations. Additional legislation, executive orders, and agency actions of lesser importance are also specified in the tables.

REVIEW OF THE IMPLEMENTATION OF POLICY RECOMMENDATIONS MADE BY OTHER STUDY COMMISSIONS

EARLY STUDIES

To help produce the implementation sequence shown above, the NTPSC reviewed the factors contributing to the successful implementation of policy recommendations made by earlier study groups, including commissions. The NTPSC found no single guide to success. In fact, because the purposes of study commission reports on transportation policy vary greatly, the extent to which the purposes are achieved (i.e., successes) will have different implications for different study groups. Some earlier study reports were meant to be interpretive, the principal purpose being to explain particular issues, policies or programs.[9] In these cases, ultimate success depended on the clarity and insightfulness of the presentation, and the receptivity of the audience.

Other reports were designed to go beyond interpretation, to offer an evaluation of issues, policies or programs, together with recommendations for improvement.[10] Defining and measuring success in these cases is more complex as such reports not only serve to interpret important issues, but also propose remedies that must in turn be implemented.

The scope of the study commission reports also varies greatly. In most cases previous studies considered only one mode, one market, one issue, or one time period, in contrast to NTPSC's simultaneous emphasis on all modes, all markets, a wide range of key issues, and future developments through the year 2000.[11] A study with a narrow scope can, nonetheless, both achieve its purpose (be successful) and perhaps more important, contribute to the effective resolution of the problems being studied (be significant).[12] The NTPSC identified several previous studies that were significant for the following reasons:

1. Recommendations were generally implemented—Cullom Report,[13] Interregional Highways Report,[14] and Doyle Report;[15]
2. Innovative topics or methods contributed to future studies and policies—Sharfman Report,[16] and Windom Report.[17]

For example, the Sharfman study of the Interstate Commerce Commission (published from 1931 to 1936) is well known because it was the first in-depth examination of a Federal transportation agency. The Windom Report is significant for its innovative topic, being the first major congressional study of transportation companies, and for the role it ascribed to reliance on competition for the attainment of low freight rates.

Of all of the criteria for measuring significance reviewed by the NTPSC, the acid test for a policy study, such as that of the NTPSC, is the degree to which the recommendations are implemented. A classic example is the Cullom Report of 1886, which recommended the regulation of railroads one year before the Interstate Commerce Commission was established by Congress to do just that. The U.S. National Interregional Highway Committee (1944) was similarly significant, although its proposed interstate expressway system was not implemented by Congress for 12 years. In most cases, implemented recommendations have been proposed prior to the significant study. For example, one of the Doyle Report's recommendations was to create a centralized promotional agency (the DOT). The Doyle Report documented over two dozen previous recommendations since 1874 to create such an agency.[18] DOT was created five years and at least two presidential policy recommendations later,[19] although it still does not contain all of the important transportation agencies (e.g., MarAd). Other recommendations of the Doyle Report, such as consolidating all congressional committees on transportation, have yet to be implemented. Many of the transportation problems of 1961 documented in the Doyle Report have become crises and have been treated, at least temporarily, by policies and programs, some of which were suggested in the Doyle Report itself. These earlier problems have been supplanted by uncertainties about energy and the environment, which may become tomorrow's crises. For the NTPSC's report to be significant, its recommendations must be implemented and must treat emerging issues as well as those that are crises today and that remain unsolved from the past.

RECENT STUDIES

In addition to a review of the earlier studies discussed above, the NTPSC considered the lessons of more recent study groups. In 1975 the General Accounting Office published an evaluation of why the recommendations of study commissions often have not been implemented.[20] Case studies of several commissions were made. In some instances, the mandate of a commission was structured to require an executive-level evaluation of the recommendations. For example, the legislation creating both the Commission on Federal Paperwork (Pub. L. 93–556) and the National Water Commission (Pub. L. 90–515) required submission of executive-branch views and legislative recommendations to the Congress after the final commission reports were transmitted. Such a requirement does not always lead to successful implementation of recommendations. The GAO reports that, despite the legislative requirement, in the case of the National Water Commission no views or legislative recommendations were submitted by the executive branch. (For the Commission on Federal Paperwork, the provisions of the enabling legislation are cited by GAO, but GAO's report was completed before the Paperwork Commission was due to submit its recommendations.)[21]

For the National Water Commission, specific implementation requirements in the enabling legislation proved no panacea. On the other hand, sometimes a study commission's report will have detailed executive and congressional scrutiny, even though its statutory authorization had no such specific requirements. The GAO gives the example of the Commission on Government Procurement (Pub. L. 91–129), for whose recommendations a detailed and effective implementation process evolved.[22] The lead agency in this process was the Office of Management and Budget (OMB), which established a two-phased program. First, individual agencies were assigned specific recommendations or groups of recommendations under the overall coordination of the General Services Administration. The agencies were to develop specific policies for each recommendation and to devise actions to implement the policies, including draft legislation where Congress had not already acted. This phase ultimately involved 14 lead agencies and 74 task groups. The second phase involved the GAO itself, which was given a special monitoring role by Congress after the report was submitted. GAO issued periodic reports to Congress on executive-level progress toward implementing the recommendations. In the case of this commission report, oversight committees were especially active in each House of Congress.[23]

In describing this example of successful implementation of a study commission's recommendations, the GAO notes that the effectiveness of the followup system may be attributable to the fact that neither OMB, GSA, or the other executive agencies, nor GAO as an arm of Congress, nor the congressional oversight committees, had a vested interest in maintaining the status quo. Here, they were able to work together.[24]

In contrast to the special provisions for implementation discussed above, the Federal Advisory Committee Act of October 6, 1972 (Pub. L. 92–463) provides a general mechanism for detailed executive involvement in the review and implementation of presidential study commission reports, even where the enabling legislation does not. Section 6(b) of the Act requires that within one year after a public report is submitted to the President, he or his delegate must report to Congress, stating either proposals for action or reasons for inaction on the recommendations contained in the report. The OMB, pursuant to Executive Order 11769 of February 21, 1974, administers the Act.

These provisions apply to the NTPSC report. However, the provisions of the Act and the Executive Order do not guarantee that a meaningful executive review will occur. The GAO describes the case of the National Commission on Materials Policy (Pub. L. 91–512) that issued its final report to the President and Congress in June 1973.[25] As required by the Federal Advisory Committee Act, the OMB designated a department as the lead agency to develop an executive branch response. The response was submitted to the OMB in November 1974, and cleared and forwarded to both Houses of Congress on April 21, 1975. For each policy recommendation of that Commission, an indication of executive branch positions of "concurrence," "concurrence in principle," "disapproval," or "seek more information" was given, together with descriptions of actions underway or planned to implement the recommendations. In this case, however, the executive response was reported by the GAO as too general to be useful in insuring implementation. For example, such terms as "efforts are underway" cannot convey much of use to congressional committees interested in charting the progress of the executive branch.[26] GAO also faults the study itself, however, stating that it would have been more useful if it had contained more specific recommended actions to deal with particular problems.[27]

BUILDING CONSTITUENCIES FOR CHANGE

Despite the importance of objective data and reasoning in determining workable policies, great attention must be paid in implementing most policies to political considerations. As the *Wall Street Journal* put it in an editorial about policies involving the Census Bureau, "Every piece of information affects someone's political agenda, and every intellectual ambiguity becomes a political contest."[28]

EXAMPLES OF IMPLEMENTATION COMPROMISE TECHNIQUES

General Principles

As the NTPSC discovered during its own deliberations, in general it is easier to generate widespread support for broad principles than for more precise policy expressions. The concept of intermodalism is a case in point. The idea that each mode should be used to its greatest advantage in combination with other modes is one with wide support. Yet, certain of the NTPSC policy recommendations designed to improve the efficiency of all modes in general, and the joint use of transport facilities and services in particular, are certainly controversial. For example, the NTPSC considered whether the Maritime Administration should be shifted to the DOT so as to foster within DOT a truly all-mode outlook. Such a move by itself, without substantive changes in policies or programs, may be merely symbolic. Yet, opposition to the symbolism and the threat of subsequent policy revisions has generated heated opposition to this specific transfer when proposed by previous study groups,[29] even though there is support for the general concept of a DOT with an all-mode focus. The NTPSC did not recommend such a transfer.

Holding Harmless

Congress has, in previous actions implementing important new transport policies and programs, used several compromise techniques to build support.

To allay fears for the short run that a particular interest group will lose under a new policy or program, Congress has often acted to "hold harmless" particular groups. For example, when Congress acted in 1978 to support transit operating deficits in the largest cities, it did not alter its previous allocation formula to favor the largest cities at the expense of smaller ones. Rather, it created several new "tiers" for the program, each with its own formula, while retaining the previous formulas as well.[30] So long as increased appropriations are available to support the hold harmless provisions, the retention of a group's absolute amount often outweighs its concern with a deteriorating relative share.

The device of holding harmless all groups is a frequent concomitant of congressional actions. In fact, rarely does any group suffer a reduced absolute amount of aid in nominal terms—as opposed to the reduction in real terms that occurs as price increases erode the purchasing power of an appropriation of a given nomimal amount.

Broadening Eligibility

Closely related to the hold harmless concept is the broadening of categories of aid to include more and more recipients. Congress acted in 1974 to provide transit operating assistance for urbanized areas (basically cities of 50,000 or above).[31] In 1978, it made smaller cities and even rural areas eligible for such assistance.[32]

Unfortunately, the NTPSC's recommendations cannot all be facilitated by keeping everyone at least as well off in absolute terms while improving the relative lot of other groups. This is true for a number of reasons. First, it is clear that the willingness, if not the ability, of U.S. taxpayers to absorb continued demands on their resources to support Federal spending programs is declining. Second, U.S. citizens are increasingly objecting to Federal intrusion in their affairs.[33] Finally, many NTPSC recommendations point to ending unfair advantages enjoyed by certain groups. With scarce resources, fairness is not enhanced by spreading such advantages to other groups. Rather, for efficiency reasons as well as for equity, NTPSC policies often require removing the unfair advantages of certain groups, so that the general taxpayer can gain.

For the sake of smooth implementation of policies it is unfortunate that resources are so limited. Interest groups that now enjoy Federal largesse have much at stake. It is worthwhile for them to fight hard to retain the advantages. On the other hand, taxpayers may often be uninformed about the real extent of the costs they must bear to support favored groups. Or, citizens may doubt that they would share in the gains that would result from a policy change. Thus, the combination of concentrated benefits from the status quo with dispersed and uncertain benefits from change yields powerful inertia favoring the continuation of current policies.

Temporary Measures and Demonstrations

Another compromise measure employed by Congress is that of proposing that a program or policy be temporary, or be part of a demonstration. Congress chose to permit taxi operators to file for refunds of the 4 cents per gallon Federal fuel tax for a 2-year period (FY 1979 and 1980). Before the end of that time, the taxi industry and the Treasury Department must report to the tax-writing congressional committees on the consequences.[34] Congress has established both a rail-highway grade crossing program for segments both on and off the Federal-aid highway system, authorizing $190 million annually for 4 years at a matching ratio of 90 percent, *and* a rail-highway grade crossing demonstration program, for which $350 million is authorized to be available over a 4-year period at a matching ratio of 95 percent.[35]

Special Studies

Congress may also act to authorize funds but at the same time require a formal study of the effectiveness of the use of these funds. For example, Congress acted in 1978 to authorize $600 million for Amtrak operating expenses and $130 million for capital outlays for FY 1979, but also required that DOT study Amtrak route restructuring.[36] Two other devices to secure implementation are evident in the Amtrak Improvement Act of 1978. First, the route restructuring proposed by DOT will automatically go into effect unless either the House or the Senate acts within 90 working days to reject any change. As Amtrak routing is a politically sensitive issue, this form of congressional ratification places the burden on those who favor the present, more extensive route structure to act to retain it. Second, the proposed route changes cannot be implemented until October 1, 1979, but must be accomplished within six months thereafter. Thus, a grace period is provided between the deadline for congressional action and the actual implementation of the new routing policies, presumably to provide Congress, Amtrak management, and the affected communities time to adjust to the proposed change. Nonetheless, Amtrak is not to be permitted to delay implementation of the restructuring for too long after this short grace period.

Phasing In

Waterway user fees provide another example of a congressional compromise. Congress acted in 1978 to impose a fuel tax on vessels using the inland waterways, with the proceeds to be accounted for in a trust fund.[37] The taxes will begin at 4 cents per gallon in 1980 and rise to 10 cents per gallon by 1985, at which time revenues are expected by the NTPSC to generate less than 20 percent of the navigation-related capital and operating costs. Proponents of proper user fees likely regard the new act as a first step toward eventually recovering 100 percent of waterway navigation costs from users through segment tolls, once the principle of user payment is firmly established.[38]

On the other hand, waterway interests may prefer a fuel tax to a segment charge. Too, the act that began the fuel tax also authorized $430 million for the construction of controversial Locks and Dam 26 at Alton, Illinois. Therefore, there was much in this act to please contestants on both sides of the waterways issue. The NTPSC supports this gradual implementation of waterway user fees.

Categorical Flexibility

Congress may enact a categorical program, but provide discretionary powers to state or local governments to shift funds among categories. Thus, for example, within various categories of Federal-aid highway programs Congress permits a recipient to shift up to 50 percent of the allocation from one category to another.[39]

Intergovernmental Relations

Congress may provide aid directly to constituent groups in cases where these groups have not had great success with their own state legislatures. Nonetheless, Congress remains aware of state interests. Therefore, Congress may enact the type of program that is evidenced by the 1974 amendments to the Urban Mass Transportation Act.[40] For a program of operating assistance for transit begun in 1974, cities of 200,000 population or above received their formula grants directly from the Federal government while for cities between 50,000 and 200,000 population, grants went to governors for allocation within each state. In 1978, Congress provided funds for small cities and rural areas of less than 50,000 population, again allocating such aid to the states for subsequent distribution.[41] Thus, cities were aided, but state governors retained some involvement.

Substitution of Projects

Controversy has existed about whether trust funds such as that for highways should be "busted" to provide funds benefitting other modes. In response to pressures to provide more flexibility in the use of previously earmarked highway funds, Congress did provide that some funds for Interstate Highway segments could be diverted to certain transit uses. However, when such a transfer occurs, the highway funds revert to the Highway Trust Fund and an equivalent grant for transit purposes is provided from general revenues.[42] Thus in this case, the Highway Trust Fund technically retains revenues earmarked for highway purposes while state and local governments are permitted the flexibility to alter spending among modes.[43]

Packaging

In some cases, legislative packages are proposed that contain widely supported measures together with more controversial actions. An example is the treatment of air passenger deregulation in 1978 (Pub. L. 95–504). Here, Congress created a schedule for phasing out CAB regulation of entry, rates, and mergers, for ending CAB local service and mail subsidies, and for ending the CAB itself. Included in the package, however, were such sweeteners as labor protection and a new 10-year subsidy program for maintaining essential air service to certain communities faced with total loss of air service.

Although the exact details of such legislative packages must be determined by individuals who have up-to-the-minute knowledge of the political forces at work in Congress, the NTPSC policy recommendations do lend themselves easily to such packaging. This is because the NTPSC impact analysis has sought to identify groups and regions that will gain and lose from each proposal, so that negotiations for compensation and trade-offs may proceed more smoothly than if such information were not available.

Quid Pro Quo

Another way of describing the process of packaging legislation is to consider the exacting of a quid pro quo for a desired change. The NTPSC has proposed that increased levels of enforcement of stronger safety regulations should be applied to all certificated carriers, and, in the case of for-hire motor carriers, that the right to operate be conditioned upon demonstration of adequate insurance coverage and payment of the Federal heavy-vehicle use tax. It is expected that the costs to certain carriers of complying will be balanced against the gains to those carriers of increased freedom to compete in markets subject to less Federal economic regulation, which is also proposed by the NTPSC, thereby providing a quid pro quo.

Another example of the possible application of this compromise device involves the collection and dissemination of information about transportation operations of private carriers. Deregulatory proposals are designed to remove complex Federal requirements from the day-to-day affairs of transport carriers, thus providing more freedom to compete without burdensome red tape. Nonetheless, part of the burden of existing regulation is the requirement to supply information about certain aspects of the business. This information is of great importance to transportation planners. For example, the ICC now directs the railroad industry to conduct a one percent freight waybill sample for the Federal Railroad Administration. This sample is very useful to government and private researchers concerned with modeling freight movements. Such data are not available for the trucking industry. A possible quid pro quo for regulatory reform of the railroad and trucking industry might be the retention of certain data-filing requirements for railroads and the imposition of such requirements for the trucking industry. When Congress acted to reform the air cargo and passenger industries, continued filing of certain economic statistics was not required (a matter which may need to be addressed in subsequent legislation). At a future date, it may be more difficult to convince air carriers that data-submission is in their best interests, as the implementing legislation may not offer direct benefits to carriers as large as those that were offered in the preceding deregulatory statutes.

COOPERATION WITHIN AND BETWEEN BRANCHES OF GOVERNMENT IS NEEDED TO FACILITATE IMPLEMENTATION

Congress

The Surface Transportation Act of 1978 (Pub. L. 95–599) seems to reflect an interim step in congressional movement toward a multimodal approach to implementing transportation programs. The Act had several sections, including one for highway programs, one for urban transit, and one for highway safety. In the House, only two committees were involved, with one set of conferees appointed to meet with the Senate. On the Senate side, four committees and five sets of conferees were involved.[44] This involvement of many separate congressional committees illustrates the complex nature of the compromises that must be engineered to secure passage of major transportation legislation. The examples above are meant to show that in previous actions Congress has been able to reach effective compromises. Compromise often means going slowly, one step at a time toward a new target or toward targets that themselves change gradually over time. There can be real costs to delay, however, so that compromises need not be "free." Alfred Kahn has described how his mind was changed (while serving as CAB chairman) to favor immediate, complete action to achieve deregulation of the air mode, as being more efficient as well as fairer than gradualism.[45]

Congress, in deregulating domestic air cargo in 1977, provided that existing, certificated, all-cargo carriers or passenger carriers operating all-cargo flights should first enjoy unlimited entry.[46] Approximately one year later all carriers were free to enter (November 1978). Carriers serving domestic markets at the time of the legislation therefore enjoyed an advantage over potential competitors who were denied automatic entry for a year. Although protection of existing market participants is often set by Congress,[47] the granting of such protection is not costless and the timing of reform is not a matter of indifference to market participants.

The Senate Committee on Governmental Affairs has concluded a two-year study of Federal regulation, pursuant to Senate Resolution 71 of the 95th Congress. In the letter of transmittal of the sixth and final volume of the study, Senator Abraham Ribicoff, Chairman of the Committee, expressed the hope that the report would make a significant contribution to the understanding of the problems of Federal regulation, and that it would provide a basis for congressional action in the 96th Congress.[48]

Senator Ribicoff and Senator Percy jointly introduced legislation early in the 96th Congress to implement some of the Committee's recommendations.[49] For example, economic impact statements are not now required of independent regulatory commissions, although these agencies may choose to comply voluntarily.[50] The Ribicoff-Percy legislation would implement a more stringent and clearly defined process to consider benefits and costs of existing and proposed Federal regulations. These proposals provide a good example of the precise language that might be necessary to implement the NTPSC policy proposals that call for such economic analyses. Also, this is an example of committed members of a study group seeking to implement the findings of that group. However, several other bills were submitted early in the 96th Congress that seek to accomplish quite similar goals using related, but not identical, implementation measures. For example, Senator Bentsen submitted a series of bills to improve regulatory procedures and to reduce duplicative and conflicting Federal rules and regulations.[51] A key to successful implementation of the recommendations of a study group then, is to have its advocates combine forces to work for passage of reform measures, even though passage may sometimes require joint referral to congressional committees and the needed cooperation might mute the public's association of an important new policy with the name of a particular legislator.

During late 1977 and early 1978, Senator Edward Kennedy's Antitrust and Monopoly Subcommittee conducted hearings throughout the U.S. concerning freight-rate competition in the motor carrier industry. In January 1979, Senator Kennedy announced a bill to repeal the antitrust exemption granted to motor carrier and freight forwarder rate bureaus available since 1948 under terms of the Reed-Bulwinkle Act.[52] Senator Cannon, as Chairman of the Senate Committee on Commerce, Science, and Transportation argued that such a bill should be referred to his committee for action, as it deals with surface transport matters, while Senator Kennedy, stressing the antitrust aspects of the bill, argued for joint referral to include his Judiciary Committee. In March 1979 Senator Kennedy did agree with Senator Cannon that referral should be made to the Commerce Committee, and that hearings would begin on the bill. The Judiciary Committee would then have a period of time after the Commerce Committee had acted to consider these actions (but not to amend the bill). A similar agreement was reached between Senator Ribicoff and Senator Kennedy regarding the consideration of President Carter's proposals to reform regulatory procedures.[53]

The point is that, even though the Judiciary Committee may not play a direct role in the implementation of its findings, the information compiled during the hearing process is available to develop informed opinion that may eventually effect change. For example, during the Kennedy hearings it became evident that little was known about the details of the motor carrier rate-determination process, and about the impacts of this process on particular shippers, communities, and carriers. As a result, Committee staff contracted with certain rate bureaus to obtain access to data that would permit such analyses. The results may be available during 1979. Also, the ICC has sought access to these data, and may begin to work with them in the near future to assist in the ICC's study of reforming its own motor carrier regulatory procedures. Again, although the exact recommendations of the Subcommittee might not be immediately implemented in the sense of being formally enacted into law by Congress, the questions asked and the partial answers given have stimulated further research that may serve to forge a stronger impetus for change.

Some of the NTPSC recommendations are likely to be promptly introduced as formal legislation. Other recommendations should stimulate congressional committees to hold further hearings, and independent researchers to perform further analyses. Informal processes are also necessary to accomplish needed change, although perhaps less certain and more time consuming than more direct policy channels.

Executive and Independent Regulatory Agencies

Administrative action alone has been enough to implement some policy reforms. The CAB, beginning with former Chairman Robson, and continuing under Chairman Kahn and Chairman Cohen, has acted quickly and extensively to ease air cargo, forwarder and passenger regulations. Congress has ratified many of these changes through legislation.[54] At the ICC, Chairman O'Neal has begun to propose widespread reforms, and Commission decisions have been forthcoming that serve to ease regulations substantially.[55]

Certain key members of Congress have exchanged letters with Chairman O'Neal, cautioning him not to usurp the responsibilities of Congress.[56] Also, opponents of the ICC reforms have sought judicial remedies.[57] Therefore, although agencies themselves can often do much on their own to alter previous agency practices, the likelihood is relatively small that such actions can, in the future, treat such major policy reforms as trucking deregulation without supportive congressional action. Even legislation does not guarantee that reforms can be quickly accomplished. For example, the 1976 4R Act provided that the ICC should permit seasonal and peak charges by railroads.[58] ICC rules were established to implement the policy, yet the first such rail rate approved was challenged by shippers in Federal court and has not yet been implemented.[59]

Similarly, railroad interests allege that the ICC effectively prevented the implementation of much of the rail pricing flexibility enacted by Congress, by defining market dominance too restrictively.[60] Congress, also in the 4R Act, provided that the ICC would be powerless to suspend a rail rate as being unjust or unreasonably high unless market dominance was found. The definition of market dominance was left to the ICC. The ICC has responded that its definition of market dominance is adequate, and that rail rate flexibility has not been used because of railroad reluctance to alter experimentally general rate levels, and for other reasons.[61] The ICC market dominance rules were upheld in U.S. Court of Appeals for the District of Columbia in 1978.[62] Also in 1978, Congress renewed a program of rail assistance which retained the concept of market dominance.[63]

This example is meant to highlight the interplay between Congress, the executive branch, the independent regulatory agencies, the judicial system, and the private sector, in implementing a policy. At any given time, all of these and more may be involved in enacting, interpreting, adjudicating, revising, and responding, all of which are part of the implementation process.

State and Local Governments

In some cases objective policy solutions based on hard evidence are not forthcoming. An example of an issue for which a technically "correct" policy has not emerged due to lack of data is the issue of what maximum size and weight motor vehicles should be permitted on Federal-aid highways.[64] Current policy sets maximum weight limits on the Interstate Highway System, but permits the states to choose lower limits, or to retain higher limits if they existed before 1956. Similar Federal weight restrictions are not imposed on other Federal-aid highways (only on the Interstate). The result is a great variety of limits which seems to please no one entirely, imposed by the states on their own highways and on various components of the Federal-aid highway system. Some truckers argue that "barrier states" impose economic losses by choosing relatively low limits, while some drivers complain of adverse safety consequences of relatively high limits. Congress and the executive branch have responded with a series of studies, none proving to be conclusive.[65]

Despite lacking data to provide a policy recommendation on this particular issue affecting state governments, in this report and several of its Special Reports, the NTPSC is deeply concerned with the transportation policies and programs of state and local governments, and their interactions with those of the Federal government.[66] This concern is especially warranted when discussing the implementation of the NTPSC policy recommendations.

The lack of a clear Federal policy may permit interest groups to work through state and local policy channels to obtain what is not forthcoming at the Federal level. In the case of state size and weight limits for highway vehicles, it is alleged (but not proved) that, as an implementation device, those who favor higher limits have been able to "whipsaw" state legislatures.[67] The process works as follows: Supporters of eased restrictions work to accomplish an increase in one dimension (e.g., length, width, height, axle weight, gross weight, multiple combinations) in one state. Neighboring states are then urged to increase their limits to match those of contiguous states to avoid becoming a "barrier" to trade. Similarly, within a state, having increased one limit, legislators are urged to raise the limits imposed on other dimensions to take full advantage of the economies available (e.g., there will be some truckers who will "cube-out"—fill the available volume—before exceeding weight limits, thereby arguing for more lenient size limits; while other truckers will exceed weight limits before using the available space, so that increased weight limits would be to their advantage).

Given the allegation that interest groups may sometimes win at the state and local level what they could not accomplish at the Federal level, it seems even more important to ascertain, through experimental research, the data required to determine and implement a consistent Federal policy on truck sizes and weights.

In addition to cases in which states might adopt policies that would not be forthcoming at the Federal level, in some cases state regulatory bodies might act to undo at the state level what Federal policy sought to accomplish for interstate transportation. An example is the action of the California state air regulatory body (California Public Utility Commission) which has sometimes required fares for flights totally within California to remain below those fares for the California portion of interstate flights that are subject to CAB jurisdiction.[68] Previously, the ability of intrastate carriers such as Pacific Southwest Airlines to earn profits while charging fares lower than interstate carriers operating route segments in California has been regarded as an argument for deregulation of interstate fares.[69] When Congress deregulated interstate air passenger service in 1978, it also acted to preempt state regulatory powers over much of intrastate air travel. California and the CAB have been disputing this preemption policy. The CAB issued a formal policy statement specifying its new broad powers over intrastate air travel on February 7, 1979. Also on February 7, 1979, the CAB announced a policy to permit intrastate fares to rise gradually over the next two years to the generally higher interstate level. The California PUC announced that it will refuse to sanction the proposed increase. Earlier, in January 1979, the CAB sought Federal court action in San Francisco to force the California PUC to stop trying to hold down air fares in the state. The CAB joined eight airlines in this action. The Court ruled in March 1979 against the California PUC, and in a related action, in June 1979 the same judge struck down the entire set of California laws regulating airline rates, routes, and services as being unconstitutional.[70]

The ability of a state to frustrate the intent of Congress was addressed in an option paper on surface regulatory reform presented to President Carter in December 1978.[71] The proposals suggest that Congress should pass such a preemption clause as part of any rail regulatory reform measure. Presently, the ability of the ICC to intervene in state regulatory affairs is limited. The ICC may overrule state regulation in the case of discriminatory rail rates, for example, and it has authority to rule on any rail abandonment, even if the segment lies totally within one state.[72] The ICC does not possess these powers for motor carriers.

Many cities and states strictly regulate urban bus and taxi service, an area that is exempted from Federal regulations. UMTA's regulations that govern the use of Federal funds for those modes must recognize that the regulatory environments vary greatly, and such local regulations are not subject to Federal preemption.

Sometimes states and cities seek Federal financial aid for transportation but object to the maze of regulations that can accompany such aid. Pressures to balance the Federal budget may suggest cutbacks in programs aiding states and local governments, and it may be the more flexible programs that suffer the first restrictions.[73] Some states threaten to voluntarily refuse certain Federal funds to escape paperwork requirements.[74]

These examples show that the implementation of NTPSC recommendations must involve state and local governments, as well as the private sector.

CONTINUING OVERSIGHT

The continuing commitment of one or more legislators can be essential to the success of a new policy or program. The needs to monitor progress, correct initial problems through technical amendments, appoint sympathetic administrators, protect the program from encroachment by other interests, and refocus the program when events alter conditions, are collectively referred to as "fixing the game" or sometimes as "serving as a referee."[75] The need to kill policies or programs that have outlived their usefulness is also apparent, but rarely accomplished, as policy euthanasia has its political costs, given the particular interests that come to rely on preservation of the status quo.[76]

Important new programs are enacted because they generate coalitions of support. Once enacted, the coalitions may dissolve and the program may not achieve its intended objectives. There are several reasons: first, different parties may have different goals for the same program. When a program is being developed, each party may support it for different reasons. Upon enactment these differences surface. An example of such a misunderstanding that occurred after the enactment of a program is provided in the protracted negotiations between World Airways and the Economic Development Administration regarding the building of a subsidized terminal.[77] Both parties wanted the air terminal, one to assist its business operations and the other to enhance its economic development goals. However, when EDA imposed minority employment objectives that World Airways believed would cause it to bear unexpected costs, a lengthy bargaining process ensued.

In addition to delays resulting from lack of common goals or misunderstood intentions, a program may fail for lack of adequate appropriations. Although Congress authorized new aid for the intercity bus industry in 1978, it did not appropriate funds.[78]

Many observers believe that bureaucracies are basically defensive, so that new programs may be met with cautious efforts designed to protect previous policies.[79] These might not be appropriate for the new program, causing it to "fail" in some sense. Complex programs also have a great capacity to bog down and self-destruct. Implementation may depend on a chain of events, each one of whose links might cause only a small delay, but when accumulated may constitute a considerable delay.[80]

The point is that even programs enacted with great promise of substantial benefits may, through delays in the implementation process, fail to achieve that promise.

INTEREST GROUP REACTIONS

In developing policies that, if implemented, would solve important transportation issues, it is often as important to know why a particular policy is favored by an interest group as to know who is supporting the policy, or even how strongly the policy is favored. This is because the reasons for the enduring transportation issues almost always go well beyond simple politics. To be finally resolved, these issues demand technical solutions that often require a great deal of data and careful objective reasoning. The details of interest group policy statements can often provide such data or reasoned arguments. On the other hand, when it is time to discuss implementation strategies, those who favor a policy may have more to say about its adoption than the technical perfection of its construction.

In issues such as the proper truck size and weight limits discussed above, for which key facts to permit an objective policy determination are missing, it is tempting to survey the public positions of important interest groups, and pick a position supported by those groups that seem to have the correct views on other issues, or to whom support should be given to balance that given to rivals on other issues, so that total opposition of any group can be avoided. However tempting such a balancing process might have been to help smooth the implementation of NTPSC's proposals, it was not employed by the Commissioners in their formulation of policy recommendations. In the case of the truck size and weight issue, no direct policy solution based on objective evidence could be developed, so that the NTPSC policy recommendation suggests that the DOT study (due to be submitted to Congress in 1981 under the mandate of Pub. L. 95–599) should be examined for evidence necessary to make an informed judgement, instead of proposing an immediate change in the status quo.

As an indicator of the carriers, users, government organizations, and other groups (such as labor unions or environmental protection advocates) that are likely to support or oppose the specific NTPSC transportation policy recommendations, the NTPSC evaluated published and less formal policy presentations of such groups, and considered the possible reaction of the groups to NTPSC proposals. Accomplishing firm coalitions of support must involve careful work directly with each group. The NTPSC study indicated that, for certain NTPSC policy proposals, broad support already may be forthcoming. These include, for example, the proposal that increased rate flexibility be allowed certificated carriers within zones of reasonableness, and the increased emphasis on enforcement of safety regulations. On the other hand, certain of the NTPSC recommendations apparently do not yet enjoy widespread support, and will require further constituency building activities to be implemented.

CONCLUSIONS

This chapter has described a policy implementation process that is as complex as the policy development process, and has pointed out that the two are intimately linked. It is hoped that the care taken by the NTPSC in its policy development, and the extensive data base and analyses prepared in support of the policy recommendations, will facilitate the tortuous implementation process that will follow.

It is likely that some of the NTPSC proposals will be met with yawns. No groups will perceive immediate gains or losses from some of the NTPSC's proposals. In these cases, a few highly committed Commissioners may themselves be able to accomplish the needed implementation measures, be they legislative or administrative changes.

Other proposals may be too little understood or too expensive to implement without an extensive education process, even if no groups offer immediate opposition. Perhaps no firm coalitions for or against the proposals have yet been forged, so that the NTPSC report and the ensuing activities may serve to raise consciousness to a level sufficient to precipitate support (or perhaps opposition). Following other major research or legislative reports, special seminars have occurred to permit discussion and evaluation of the proposals under the sponsorship of organizations not directly involved in the original studies. For example, the Transportation Research Board, Transportation Research Forum, Brookings Institution, and American Enterprise Institute have all served as forums to evaluate and disseminate the findings of research studies.[81]

As part of the implementation process, Commissioners and key staff may be expected to give speeches, grant interviews, write articles, and publish books explaining the NTPSC process and recommendations.[82] Interested outsiders may also publish evaluations of the NTPSC reports.[83]

Finally, in some cases NTPSC recommendations and supporting evidence will find ready-made proponents and opponents. The cases of motor carrier regulatory reform, waterway user fees, and preservation of modal trust funds are notable examples. In fact, on such issues the battlelines are often so firmly drawn that any new evidence produced by NTPSC might not change the minds of most participants in the policy wars. Rather than being part of an educational process, the NTPSC report sometimes could be used as a weapon, with little objective regard for its content. Because controversial decisions have been made by the NTPSC, it seems impossible totally to avoid such use of the report. It is hoped that the report, considered as a whole, is broad enough in scope and deep enough in content to withstand charges levied by particular interest groups that might wish to discredit the entire report for positions it takes on a few controversial matters.

The following chapter summarizes the NTPSC research findings, policy proposals, and impact analyses.

NOTES AND REFERENCES

1. The Federal-Aid Highway Act of 1976, Section 154, Pub. L. 94–280, 90 Stat. 448 (1976).
2. Airline Deregulation Act of 1978, Pub. L. 95–504, 92 Stat. 1705, amending 49 U.S.C. Section 1301 (1979). Domestic air cargo was deregulated in 1977. See Pub. L. 95–163, 91 Stat. 1278, amending 49 U.S.C. Section 1301 *et seq.* (1979).
3. See: James C. Miller III, "A Perspective on Airline Regulatory Reform," *Journal of Air Law and Commerce* 41 (Autumn 1979), pp. 679–701; John W. Snow, "Aviation Regulation: A Time for Change," *Journal of Air Law and Commerce* 41 (Autumn 1975), pp. 637–664; and Theodore E. Keeler; "Domestic Trunk Airline Regulation: An Economic Evalu-

ation," in U.S. Congress, Senate, Government Affairs Committee, *Study of Federal Regulation,* Appendix to Volume VI: *Framework for Regulation,* Washington, D.C.: December 1978, pp. 75–163.

4. Edward Jordan, Chairman and Chief Executive Officer of Conrail, presentation to the NTPSC, Washington, D.C., December 12, 1978.
5. The American Trucking Associations have proposed draft legislation that would provide a modicum of regulatory reform. Also, some private carriers and representatives of independent owner-operators and agricultural cooperative trucking ventures do support substantial deregulation.
6. See "With Rank and File in Charge, NITL Shapes Regulatory Policy," *Traffic World,* 7 May 1979, pp. 35–36.
7. Strong interest continues on the part of Senator Kennedy to effectively deregulate the trucking industry, as evidenced by the proposed "Trucking Competition and Regulatory Reform Act of 1979" (unpublished working draft, May 1979).
8. U.S. Congress, Senate, Committee on Commerce, Science, and Transportation, *The Impact on Small Communities of Motor Carriage Regulatory Revision,* Washington, D.C.: Government Printing Office, June 1978.
9. Although not the work of a study commission, the following reference provides an excellent presentation of choices without recommending specific policies: U.S. Department of Transportation, Office of the Secretary, *National Transportation Trends and Choices (to the Year 2000),* Washington, D.C.: Government Printing Office, 1977.
10. See for example: U.S. Congress, Senate, Committee on Interstate and Foreign Commerce, Special Studies Group on Transportation Policies in the United States, *National Transportation Policy,* Report No. 445, 80th Cong., 1st sess., Washington, D.C.: Government Printing Office, 1961. (Hereafter cited as Doyle Report.)
11. An exception is the 1942 report of the National Resources Planning Board, which was a large-scale, forward-looking report reflecting the expanding goals of the "New Deal." U.S. National Resources Planning Board, *Transportation and National Policy,* Washington, D.C.: Government Printing Office, 1942.
12. A full set of recommendations for regulatory reform, of decided interest to today's reform movement, is to be found in the reports of the Board of Investigation and Research. For a synopsis, see *Federal Regulatory Restrictions Upon Motor and Water Carriers,* letter from the Board of Investigation and Research transmitting a summary of a report, H. Doc. No. 637, 78th Cong., 2d sess., Washington, D.C.: Government Printing Office, 1944.
13. U.S. Congress, Senate, Select Committee on Interstate Commerce, *Report of the Select Committee on Interstate Commerce,* Senate Report No. 46, 49th Cong., 1st sess., Washington, D.C.: Government Printing Office, 1886. (Hereafter cited as Cullom Report.)
14. U.S. Congress, House, Committee on Roads, *Interregional Highways: Message from the President of the United States Transmitting a Report of the U.S. National Interregional Highway Committee Outlining and Recommending a National System of Interregional Highways,* H. Doc. No. 379, 78th Cong., 2d sess., Washington, D.C.: Government Printing Office, 1944.
15. Doyle Report.
16. I. L. Sharfman, *The Interstate Commerce Commission, A Study in Administrative Law and Procedure,* Vols. 1 and 2, New York: Commonwealth Fund, 1931, Vols. 3 and 4, London: Oxford University Press, 1935, 1936.
17. U.S. Congress, Senate, Select Committee on Transportation—Routes to the Seaboard, *Report of the Select Committee on Transportation—Routes to the Seaboard,* 43rd Cong., 1st sess., Washington, D.C.: Government Printing Office, 1974. (Hereafter cited as Windom Report.)
18. Doyle Report, pp. 97–98.
19. U.S. President, John F. Kennedy, "Special Message to Congress on Transportation, April 5, 1962," *Public Papers of the President, Volume 2: January 1–December 31, 1962,* Washington, D.C.: Government Printing Office, 1963, pp. 292–306; and U.S. President, Lyndon B. Johnson, "Special Message to the Congress on Transportation, March 2, 1966," *Weekly Compilation of Presidential Documents: Volume 2: January 10–July 4, 1966,* Washington, D.C.: Government Printing Office, 1966, pp. 250–263.
20. U.S. General Accounting Office, *Better Followup Systems Needed to Deal with Recommendations by Study Commissions in the Federal Government,* Report No. RED–76–33, Washington, D.C.: 4 December 1975.
21. *Ibid.,* p. 23.
22. *Ibid.,* p. 18.
23. *Ibid.*
24. *Ibid.,* p. 22.
25. *Ibid.,* p. 16.
26. *Ibid.,* p. 17.
27. *Ibid.*
28. *Wall Street Journal,* 8 February 1979, p. 18.
29. See, for example, the Doyle Report.
30. Federal Public Transportation Act of 1978, Pub. L. 95–599, Title III, 92 Stat. 2689, amending 49 U.S.C. Section 1601 (1978).
31. National Mass Transportation Assistance Act of 1974, Pub. L. 93–503, 88 Stat. 1565, amending 49 U.S.C. Section 1604 (1976).
32. Federal Public Transportation Act of 1978, Pub. L. 95–599, Section 313, 92 Stat. 2689, amending 49 U.S.C. Section 1614 (1979).
33. Several western states have considered increases in their speed limits beyond the maximum 55 miles per hour required by Federal law as a condition of receipt of certain Federal highway aids. For example, in Wyoming, Senate Bill 117 would have increased the state speed limit to 65 mph although the state legislature acted to defeat such a proposal. States risk loss of portions of their Federal-aid highway allocations if they do act officially to rescind their 55 mph speed limits. In the first session of the 96th Congress, Senator Hayakawa introduced a bill (S–323) that would repeal the Federal 55 mph requirement.
34. Highway Revenue Act of 1978, Pub. L. 95–599, Title V, 92 Stat. 2756 (1978). In this act, Congress also exempted intercity buses from payment of the Federal highway fuel tax, but did not make this exclusion temporary as it did for taxicabs.
35. Highway Safety Act of 1978, 23 U.S.C. Section 130 (1978), Pub. L. 95–599, Section 203, 92 Stat. 2728.
36. Amtrak Improvement Act of 1978, Pub. L. 95–421, 92 Stat. 923 (1978). The study was submitted to Congress in January 1979.
37. Inland Waterways Revenue Act of 1978, Pub. L. 95–502, Sections 201–206, 92 Stat. 1696, amending 33 U.S.C. Section 1801 *et seq.* (1979).
38. Waterway user fees to recover 100 percent of all Federal outlays have been proposed in several studies, including: U.S. Department of Commerce, Transportation Study Group, *Report on Federal Transportation Policy and Program,* Washington, D.C.: Government Printing Office, March 1960 (also known as the Mueller Report); Doyle Report; and National Water Commission, *National Water Commission Report* (to Congress and the President pursuant to Pub. L. 90–515), Washington, D.C.: Government Printing Office, June 1973. These and other proposals are discussed in Marvin J. Barloon, *Water Transportation: Productivity and Policy,* prepared for the National Environmental Development Association, Washington, D.C.: June 1978. It should be noted that Pub. L. 95–502 does not itself state that 100

percent cost recovery is beneficial or expected to occur in the future.

39. Federal-Aid Highway Act of 1978, Pub. L. 95–599, Title I, 92 Stat. 2689, amending 23 U.S.C. Section 101 *et seq.* (1979). The categories are: primary, secondary, and urban.

40. National Mass Transportation Assistance Act of 1974, Pub. L. 93–503, 88 Stat. 1565, amending 49 U.S.C. Section 1604 (1976).

41. Federal Public Transportation Act of 1978, Pub. L. 95–599, Section 313, 92 Stat. 2689, amending 49 U.S.C. Section 1614 (1979).

42. 23 U.S.C. Section 103 *et seq.* (1978). This provision will expire in 1983. Federal-Aid Highway Act of 1978, Pub. L. 95–599, 92 Stat. 2689, amending 23 U.S.C. Section 103 (1979).

43. Congress has permitted directly diverting other categorical highway funds to transit uses, however, as provided in Federal-Aid Highway Act, 23 U.S.C. Section 103 *et seq.*, as amended (1978).

44. See *Congressional Record,* 14 October 1978, p. H 12933.

45. Alfred E. Kahn, "Applying Economics to an Imperfect World," Richard T. Ely Lecture, reprinted in *American Economic Review* 69 (May 1979), pp. 1–3.

46. Pub. L. 95–163, 91 Stat. 1278, amending 49 U.S.C. Section 1301 *et seq.* (1979).

47. In 1935, Congress passed the Motor Carrier Act which became Part II of the Interstate Commerce Act. The Act provided that motor carriers should be certificated by the ICC, but approximately 35,000 carriers operating at the time received "grandfather rights."

48. U.S. Congress, Senate, Committee on Governmental Affairs, *Study on Federal Regulation, Volume VI: Framework for Regulation,* Washington, D.C.: Government Printing Office, 1978, p. III.

49. S–445, 96th Cong., 1st sess. (1979).

50. Executive Order 11590 requires the analyses be performed by executive agencies.

51. S–51, 52, 53, 54, 96th Cong., 1st sess. (1979).

52. The Kennedy bill was formally introduced in March 1979 as S–710, 96th Cong, 1st sess. (1979). The Reed-Bulwinkle Act is 49 U.S.C. Section 10706(b) (1978).

53. S–775, 96th Cong, 1st sess. (1979).

54. Air cargo: Pub. L. 95–163, 91 Stat. 1278, amending 49 U.S.C. Section 1301 *et seq.* (1979); Air passengers: Airline Deregulation Act of 1978, Pub. L. 95–504, 92 Stat. 1705, amending 49 U.S.C. Section 1301 (1979).

55. See for example Ex Parte No. MC–121 (6 November 1978), which would establish a policy of regulatory reform; *Liberty Trucking Co.–Ext. Gen. Com.,* 130 MCC 243 (6 October 1978), which eases motor carrier entry restrictions; and Ex Parte No. 359, *Water Carrier Regulation* (18 December 1978), which proposes a virtual end to all ICC regulation of water carriage.

56. *Railway Age,* 29 January 1979, p. 12.

57. See for example: *Mercury Motor Express, Inc. and American Trucking Associations, Inc. v. United States and Interstate Commerce Commission,* Civil No. 79–1052 (5th Cir., filed 8 January 1979) in which the ICC's policy decision to permit private carriers to perform for-hire carriage is being challenged. Also, the ATA is seeking to stay, pending judicial review, the ICC's decision in Ex Parte 55, Sub. No. 26 *Protest Standards in Motor Carrier Application Proceedings* (reported in *Traffic World,* 5 March 1979, p. 113).

58. Railroad Revitalization and Regulatory Reform Act of 1976, Section 202(d), Pub. L. 94–210, 90 Stat. 38, amending 49 U.S.C. Section 10727 (1978).

59. Ex Parte No. 324, *Seasonal, Peak & Regional Rail Rates.*

60. 4R Act, Section 202(b), 49 U.S.C. Section 10709; Ex Parte No. 320, *Special Procedures for Making Findings of Market Dominance as Required by the 4R Act,* and Local Rail Service Assistance Act of 1978, Pub. L. 95–607, 92 Stat. 3059 (1978), which renewed the market dominance concept.

61. *Railway Age,* 29 January 1979, p. 12.

62. *Acheson, Topeka & Santa Fe RR. Co. v. ICC, et al.,* 580 F. 2d 623 (D.C. Cir., 1978).

63. Local Rail Service Assistance Act of 1978, Pub. L. 95–607, 92 Stat. 3059.

64. For a further discussion of this issue, refer to NTPSC Special Report 1, *Current Transportation Issues in the United States,* Volume I, Report No. NTPSC/SR–79/01–A, Washington, D.C.: September 1978, pp. 14–15, and Volume II, Report No. NTPSC/SR–79/01–B, Washington, D.C.: September 1978, pp. 89–97.

65. The most recent study was required by the Surface Transportation Act of 1978 (Pub. L. 95–599, 92 Stat. 2689 (1978)) together with a study of the closely related issue of whether various classes of highway users contribute their share of the costs of highways.

66. The chapter and report of most direct relevance are: Chapter 3; and NTPSC Special Report No.4, *State and Local Transportation Policies and Programs,* Report No. NTPSC/SR–79/04, Washington, D.C.: April 1979.

67. See Wisconsin Department of Transportation, Division of Planning, "Evaluation of 65-Foot Trucks and Twin-Trailers in Wisconsin," unpublished research memorandum, Madison, Wisconsin: April 1977.

68. *Wall Street Journal,* 7 February 1979, p. 4. The remainder of the discussion of the CAB interstate fare policy is also taken from this source.

69. Keeler, "Domestic Trunk Airline," pp. 75–163.

70. *Wall Street Journal,* 13 March 1979, p. 16 and 4 June 1979, p. 16.

71. U.S. Department of Transportation, "Rail Regulatory Reform Options," transmitted to the President by memorandum from Secretary Brock Adams, Washington, D.C.: 15 December 1978, p. 40.

72. Interstate Commerce Act, Section 3 (4), 49 U.S.C. Section 10741 (1978).

73. Dennis Farney and James C. Hyatt, "A Good Way to Get a Fat Lip," *Wall Street Journal,* 27 February 1979, p. 24.

74. American Association of State Highway and Transportation Officials presentations to NTPSC, 31 August 1978 and 5 October 1978.

75. See Eugene Bardach, *The Implementation Game: What Happens After A Bill Becomes Law,* Cambridge, Mass.: MIT Press, 1977, pp. 268 ff. and W. Henry Lambright, *Shooting Down the Nuclear Plane,* Indianapolis and New York: Inter-University Case Program and Bobbs-Merrill, 1967.

76. As discussed in Chapter 2 above, and in NTPSC Special Report No. 6, *A Compendium of Federal Transportation Policies and Programs,* Report No. NTPSC/SR–79/06, Washington, D.C.: March 1979, new policies are often superimposed on existing policies without formally repealing those with which the new policies conflict. This is obvious if one remembers that policies, as defined by the NTPSC, are not all formally enacted into statutes or rules, but include many less formal expressions of guides for choice.

77. This example is documented in: Jeffrey L. Pressman and Aaron Wildavsky, *Implementation,* Berkeley: University of California Press, 1973.

78. Federal Public Transportation Act of 1978, Pub. L. 95–599, Section 323, 92 Stat. 2735, amending 49 U.S.C. Section 1618 (1979).

79. See for example, Anthony Downs, *Inside Bureaucracy,* Boston: Little Brown & Co., 1967.

80. This process is described in Bardach, *The Implementation Game.*

81. The NTPSC did present a progress report to the Transportation Research Board membership on 19 January 1979, during its 58th Annual Meeting, Shoreham Americana Hotel,

Washington, D.C. A similar presentation on the completed report is planned for the Transportation Research Forum's 1979 annual meeting to be held in Chicago, Illinois, 29–31 October 1979.

82. One of several examples is the book published by staff of the Hoover Commission enlarging on its findings. See Charles L. Dearing and Wilfred Owen, *National Transportation Policy*, Washington, D.C.: The Brookings Institute, 1949. The relevant formal report of the Commission itself is: U.S. Commission on the Organization of the Executive Branch of Government, *Regulatory Commissions: A Report to the Congress*, Washington, D.C. Government Printing Office, March 1949.

83. See Paul McAvoy and John Snow, *Regulation of Entry and Pricing in Truck Transportation*, Ford Administration Papers on Regulatory Reform, Washington, D.C.: American Enterprise Institute for Public Policy Research, 1977.

16

Summary and Conclusions

INTRODUCTION

The work of the NTPSC and its policy recommendations are reviewed in this chapter. Moreover, the chapter shows, point-by-point, how the research of the NTPSC was related to answering the mandate of the Commission's enabling legislation (Pub. L. 94–280, Section 154).

The NTPSC believes that facilitating public understanding of the reasons for its policy recommendations, and knowledge of the expected impacts of these recommendations, is an important responsibility. Despite careful concern for organization and method, this report contains a tremendous volume of material, much of it new. Confronted with such an accumulation of information, it is easy to lose track of the purpose of the NTPSC analyses, and of the themes which run throughout its work. Thus, this chapter retraces the arguments that have been made in the report, giving primary concern to the common threads among its chapters and the NTPSC's special reports that tie them to the policy recommendations.

REVIEW OF THE STUDY

TRANSPORTATION ACTIVITY AND INSTITUTIONS

The first several chapters in this report describe existing U.S. transportation institutions, provide data about current levels of service, highlight transport policies and programs of Federal, state, and local governments, and compare certain foreign transportation experiences to those of the U.S. These chapters are designed to describe the existing situation in the U.S. in some detail, to indicate important transportation issues that are in need of resolution through new national policies, and to set the stage for NTPSC policy recommendations through an objective presentation of evidence. Despite concentration on the existing situation, this group of chapters contains much information that is new, and does highlight the NTPSC's unique study plan. For example, for new NTPSC policies to be successfully implemented, they must treat the real concerns of the transportation community, and they must work through the formal and informal channels of the political system of the U.S. Chapter 1 addresses these functions, institutions, and activities.

For Congress, the President, and the citizens of the United States to understand the transportation issues, to evaluate alternative policy solutions (including those proposed by the NTPSC) and to seek corrective action where warranted, all should share a common knowledge of how the transportation system works, what levels of service are provided at what costs, and what volumes of passengers and freight move in particular markets and regions by the various modes.

All levels of government influence the U.S. transportation system through policies and programs. Guides for action (policies) together with the actions themselves (programs) work through formal and informal channels, and often may have unexpected repercussions. Chapter 2 discusses the Federal system of transportation policymaking, highlights the body of policies and programs that exists, and indicates the gaps and conflicts (issues) in present policies that are candidates for resolution through new NTPSC policies. Although there may exist compilations of Federal programs (usually only for one mode or one market), the NTPSC's presentation of policies and programs for all markets, is totally new. Appendix I provides a discussion of policy relationships, including definitions of important terms.

Chapter 3 describes state, local, and regional government policies and programs that interact with those of the Federal government to comprise *national* policy. Again, in addition to an informative presentation of how policies and programs interact, emphasis is on the issues that arise from partnership problems. Recognition by the NTPSC that levels of government other than the Federal shape national policy, and must help to define the issues and share in the implementation of policies to resolve issues, appears to be unique.

Chapter 4 presents information about transport policy from other developed countries. The U.S. can learn from its differences with these countries, just as it can learn from those cases in which similarities exist and comparable policies might apply. Identifying the European experiences can provide a sensitivity test for possible U.S. changes, to help determine whether policies that are effective today will remain so under changed conditions. The comparative information in this chapter also serves to identify issues, and to introduce alternative candidate policies for resolving the issues.

Together, Chapters 1 to 4 seek to define the status quo in common terms with a consistent, unifying market structure. They define issues. Through objective discussions of which policies and programs have worked well and which have not (at various levels of government and in several countries), the chapters set the stage for the NTPSC policy recommendations.

FORECASTS TO THE YEAR 2000

The second group of chapters builds on the institutions and policies presented in the first group. This second set treats the NTPSC's expectations for the future, given the forces set in motion by these existing U.S. institutions and policies. The NTPSC forecasts are *not* of what it would like to see happen, but rather, show the expected consequences of continuing to operate according to present policies.

To develop these forecasts, the NTPSC applied an ambitious set of models. Some of the models are variations of those which have been used before, while others are new; their use as an integrated set is unique. The NTPSC is concerned with describing the strengths and weaknesses of its modeling process as well as with presenting the results. This is because any effort to foresee events 20 years into the future will find unexpected occurrences altering the values of important causal factors. The predicted outcomes will never compare exactly to the actual events. Too, the underlying causal relationships might change. Models are most useful, therefore, for the logic of their predictions (to aid understanding) and for testing the sensitivity of possible outcomes to changes in the proposed policies. For the predictions of models to be most useful, the models themselves should be thoroughly understood.

Chapter 5 introduces the models and describes part of the NTPSC's effort to determine possible values for important parameters. Large-scale models usually rely on extrapolations of past relationships among variables in order to predict future events. If major changes are expected to occur in these structural relationships, naive (or even sophisticated) extrapolations based on previous relationships will not be very accurate (unless by accident). One way to cope with uncertain future events that can alter past trends is to develop scenarios that may hypothesize new combinations of parameter values and even new structural relationships not based totally on past trends. Scenario development also serves to highlight issues that might emerge in the future and that may not be evident today. Scenarios can be worked through to final conclusions about transportation matters of interest in a manner independent of models. This can be done as a check on the sensitivity of models to major institutional changes. Another use of scenarios is to apply them in combination with models, to determine alternative parameter values which then are worked through the models to arrive at the predicted transportation outcomes. Both approaches were used by the NTPSC. Three different scenarios were developed reflecting realistic and internally consistent combinations of economic and social variables. The three scenarios bound what the NTPSC believes to be the expected range of values for these variables, under a variety of possible future events. One of the scenarios is most like a continuation of present trends. Lacking any knowledge of what will actually happen in the future, this scenario seems to be the most comfortable for many persons. Nonetheless, if events do change, the projections made using the other two scenarios can indicate what consequences can occur. One factor in determining new transportation policies is, then, to test their robustness in treating the issues expected to emerge under all three scenarios.

Other recent studies of the future have also relied on scenario development as a tool. The NTPSC treatment may be different, as it integrates its scenarios with its battery of models.

Chapter 5 presents data about expected levels of such variables as GNP, income, employment, labor force participation, and population (19 major variables in all). Appendix II compares the NTPSC's figures with those of other modeling efforts.

Chapter 6 contains information on technological developments that may alter expected future transportation relationships. Based on mail surveys, personal interviews, and literature searches, the NTPSC evaluated the expected feasibility of commercial introduction of important new "hard" and "soft" technologies. In the past, where seemingly insurmountable obstacles have threatened the U.S., the emergence of new technologies has often provided a means to overcome these obstacles. The NTPSC evaluation reveals that new technologies do have much to contribute in the next two decades, but that they will not offer any magic solutions to transportation problems. Although further development of the diesel engine for automobiles and engine improvements for airplanes offer opportunities for better performance, reduced operating costs, and fuel economy, these are not startling and totally new breakthroughs. They represent an evolution of technical methods and products. And, although they offer an opportunity to treat transportation problems, they are not without their own difficulties.

Chapter 6 thus serves to describe emerging technologies, to highlight issues, to evaluate alternative candidate policies to resolve the issues, to forecast rates of introduction of certain combinations of new technologies, and to define parameter values for use in the NTPSC's models.

Chapter 7 describes some of the non-economic, or less quantifiable, aspects of the existing and future U.S. transportation system Current environmental and safety goals, policies, and programs are discussed. The chapter develops parameter values for use in the NTPSC forecasting models. It defines emerging issues and discusses candidate policies. The widespread use of the diesel engine may offer great opportunity for conservation of energy, and may simultaneously permit automobile manufacturers to meet certain air pollution standards. Yet, diesel exhaust may not meet other EPA emission rules and may have adverse effects on human health in ways that are not now covered by Federal standards. Clearly, neither unqualified support or opposition for dieselization is possible. Material in Chapter 7 is meant to form a base from which a detailed, realistic recommendation on such matters can be determined.

Chapter 8 focuses on energy matters. Congress directed the NTPSC to investigate energy requirements and availability to meet anticipated transportation needs. Energy is one of the largest components of the operating cost of most transportation modes, while energy movements through the U.S. are also of vital importance. To illustrate the variety of concerns discussed in Chapter 8, it was found that auto fuel efficiency has the potential for marked improvement—and as the auto is the chief consumer of petroleum, such conservation offers opportunity for great savings. Railroads are indispensable for hauling coal that can, through direct burning for electricity or indirect use (via production of synthetic crude oil or gas), permit the U.S. to have "enough" energy during the next 20 years, although not totally ending the U.S. dependence on foreign petroleum. The mutual importance of U.S. energy and transport development is also apparent in the opportunities for water carriage of coal (thereby greatly expanding inland waterway employment after 1985, for example, and reversing the current trend to less use of Great Lakes shipping). Similarly, existing pipelines that might otherwise operate at reduced levels as domestic petroleum production falls, may be used instead to link refineries of synthetic crude oil with customers.

While increased transport required by the development of new energy sources will mean better utilization of surplus transport capacity in the existing transportation system, major new investments are also needed. Alaskan energy reserves will increase substantially in importance, requiring expansion of pipeline facilities and threatening regional dislocations unless new policies are introduced. For example, one way to ease the glut of oil in California is to permit swaps with Japan of Alaskan crude for crude from other sources. Delivery of the substitute crude to energy deficient U.S. regions might occur at less expense. Such swaps are not now permitted by Congress.

Thus, Chapter 8 describes existing and proposed energy policies and programs together with transport policies and programs for conserving and for moving energy. Emerging issues are defined. Alternative parameter values for the NTPSC's set of models are given. Forecasts are made of energy availability and of transportation capabilities in the event of new energy policies with baseline transportation policies. Reasons are given as to why the U.S. will place greater reliance on energy from domestic energy supplies. Alternative policies for resolving the issues and improving the forecast results are evaluated. Special information about the expected movement of U.S. coal and about the development of alternative energy sources is to be found in Appendix III. Compared to the other chapters, Chapter 8 fulfills a more complex set of purposes. The detailed modeling of energy and transportation matters as a unified set is a unique approach of the NTPSC.

Chapter 9 gives the results of the NTPSC transport activity forecasts. The data reveal what will result, for each scenario, if the U.S. continues its existing transportation (and related) policies. The forecasts yield a baseline from which impacts of proposed policy changes can be measured. Unlike the forecasts of other transportation study groups, those of the NTPSC are structured according to markets, to give a picture of the interactions of various components of the U.S. transportation system. Data for individual modes, for cities of various sizes, and for regions, are given at five-year intervals for three scenarios. The results of the transport forecasts are compared to those of other major modeling efforts in Appendix II. One difference is that the NTPSC paints a generally more sanguine picture for U.S. railroads than do other studies, while the NTPSC sees the modal share of the U.S. trucking industry declining if existing policies are continued. One reason for the difference is the NTPSC premise that large increases will take place in coal production, and that great amounts of coal will be transported by rail and other modes, especially from the Northern Great Plains region.

In addition to giving the forecast results, the chapter raises emerging issues, and provides data necessary to evaluate potential new transportation policies to solve the problems foreseen in a continuation of existing policies.

Chapter 10 contains data on the capital (and other) resources that must be forthcoming if projected activity levels are to be realized. Existing institutional mechanisms for raising capital for various modes are described. Issues that emerge from the accumulation of capital, land, and labor resources to provide transportation services are discussed. In the chapter it is shown that the railroad industry has had relative success in financing rolling stock (as opposed to maintenance and upgrading of rights-of-way) because of the nature of the security and the availability of trust certificate financing. Yet, the existence of such security for rolling stock has made more difficult the restructuring of bankrupt railroads because of these prior claims on rail assets.

Chapter 11 sums up the forecast results by discussing the implications for carrier revenues compared to costs, using the concept of a "transportation bill." This hypothetical bill is the sum of revenues of for-hire carriers, private capital and operating costs, and net government subsidies. The forecasts discussed in Chapter 11 show the expected levels of net subsidy to the various modes under a continuation of current policies. These data permit the analysis of whether the benefits derived from such subsidies appear to be worth their costs. The presentation of market and regional detail facilitates such analysis. Appendix IV further describes the computation of the government accounts.

The second set of chapters is in some ways similar to the first. Both describe current institutions and policies, highlight issues, and evaluate candidate policies to improve the situation. The second set of chapters goes beyond the first, however, by building a forecasting process, and by using the process, plus information from other research and studies, to describe the expected future consequences of continuing present policies. Issues that will emerge in the future are, thus, added to those evident from an examination of the past and present.

ISSUES AND POLICY RESOLUTION

The final set of chapters first sums up the issues that were presented in earlier sections, and then uses the institutional descriptions, forecasting models, and results to prescribe solutions to these issues. Clearly, no group of policy recommendations would please everyone. But recommendations can be evaluated when both the adverse consequences and the benefits that are believed to outweigh such costs are presented. The NTPSC's policy recommendations vary from broad and thematic, to narrow and detailed, so as better to treat the range of issues. The issues themselves vary from vague concerns to precise problems. However, in all cases an attempt was made to explain the anticipated impacts of putting the new policies into place.

The NTPSC has shown concern for structuring its recommendations as a set that can serve as a *national* transportation policy, rather than as a loose collection of proposed Federal actions to treat separately each individual issue. In addition to using a consistent structure to present its recommendations, the NTPSC has suggested which agencies should act, and when, to implement the policies.

Chapter 12 summarizes the issues that were indicated in the preceding chapters. The issues are shown to be related to the nation's overall goals (e.g., energy conservation and development, environmental protection) as well as to goals for the transportation system (e.g., adequate service). In addition to issues pertaining to goals, some are related to the means by which the goals are pursued (e.g., public versus private financing). Two themes that run throughout the issues indicate the direction successful new policies must take:

1. The importance of pricing mechanisms to allocate scarce resources efficiently; and
2. The need for governments to maintain the role of private enterprise as providers of transportation, with all levels of government cooperating to ensure equitable taxation and regulation.

Chapter 13 gives the NTPSC policy recommendations. The relative location of this chapter within the final report is significant. NTPSC has chosen to build a solid foundation for its recommendations through identification of existing institutions and policies, determination of current and emerging issues, and formulation of a complete set of forecasting models, *before* presenting its policy recommendations. The recommendations are meant to build upon the status quo, rather than totally replacing existing institutions and policies. The NTPSC concern for structure is also shown by its presentation of policy recommendations according to the instruments of policy implementation that were used throughout the report (e.g., regulation—both economic and non-economic; ownership and operations; finance, pricing, and taxation; planning and information; and government organization). Where necessary, special policies are indicated that pertain to particular markets, modes, regions, or to passengers or freight. For each new policy, its current counterpart is shown (labeled "status quo") to permit a comparison with present practices. The thrust of the policies can be summarized by listing the NTPSC policy themes:

1. There should be a uniform national transportation policy;
2. There should be a reduction in Federal involvement;

3. Economic analyses of intended Federal actions should be performed;
4. When the transportation system is used to pursue non-transportation goals, do so in a cost-effective manner;
5. Federal involvement in transportation safety and research is often required; and
6. Users and those who benefit from Federal actions should pay.

The recommendations are ambitious in proposing strong efforts to deregulate transportation and in requiring careful economic evaluation of the benefits and costs of Federal actions before, during, and after programs are implemented. In addressing the U.S. maritime transportation sector, a continuation of many existing protective measures is recommended on grounds of national defense and security, but modifications are proposed to improve the cost-effectiveness of these Federal programs. Regarding financing U.S. transportation, given the projected revenue shortfalls and the desirability on efficiency and equity grounds of policies that require the user to pay, the NTPSC has shown that increased or restructured fees for certain modes will be necessary in order to maintain existing levels of service. The continued use of modal trust funds and of financing of certain other modes from the general fund are also recommended.

The policy recommendations in Chapter 13 are meant to be the logical conclusions from the exercise of informed judgement by the Commissioners given the data and methods of the earlier chapters. Appendix V describes, in more detail, the policy development process employed by the NTPSC.

Chapter 14 contains the projected consequences of the new policies, compared to what would occur if existing policies were retained. The structure used to analyze the impacts of the new policies is that of eleven transportation goals. These goals are often cited by policymakers as justifications for particular transportation policies or programs. Thus, for each NTPSC policy recommendation, the expected impacts are reported for as many of these eleven goals as possible:

1. Adequate service;
2. Appropriate rates and prices;
3. Economic efficiency;
4. Energy conservation and development;
5. Environmental protection and enhancement;
6. Safety;
7. Employment;
8. Industry promotion and protection;
9. Regional and urban development;
10. Equity; and
11. Defense.

Throughout the chapters of the report the assumptions necessary to justify particular predictions, and the details of the methods chosen for analysis, are given. Where statements are controversial, or require supportive judgement, these facts are indicated. Comparisons were made with the results of other studies which used alternative methods and sometimes obtained different results. The NTPSC recognizes that predicting the consequences over 20 years of new policies that may or may not be implemented over the period is more complex than predicting the consequences of existing policies. The policy recommendations were made based on the opportunities they offered as a set to resolve the transportation issues facing the United States through the year 2000, as well as based on the quantitative predictions described in Chapter 14.

Chapter 15 discusses implementation of the NTPSC policy recommendations. The experience of earlier study groups is examined, and the alternative formal and informal methods that might be used to accomplish the NTPSC recommendations are presented. The numerous individual policies recommended by the NTPSC cannot all be implemented immediately, or through only a few channels. Rather, the policies must be addressed in sets, carefully staged through time and via the proper policymaking bodies to maximize their effectiveness. One desirable combination of timing and implementing organizations is given in the chapter. For example, Congress is asked to reauthorize the Airport and Airways Development Trust Fund before it expires in 1980 and make it permanent. Further, until the concept of an urban transit trust fund is studied, transit authorizations should be reviewed periodically. Decisions on policies to promote new pipelines to serve synthetic crude oil production plants, and whether such plants should be consolidated or decentralized, must be made soon. This is the case even though such pipelines and the plants they serve might not come into operation until the 1990s. These decisions will involve all branches of government and the private sector.

RESEARCH METHODS AND SPECIAL STUDIES

The NTPSC has been concerned with proper study methods and documentation as well as recommending and publicizing new transportation policies. The Commission was created by Congress in mid-1976. Congress specified several items for the new Commission to address, and required the cooperation of Federal agencies, as well as specifying a reporting deadline (July 1, 1979) and appropriating funds (totalling $5 million). However, the NTPSC was given wide latitude as to exactly *how* it should structure its study. Commissioners and staff gave great attention to the workplan that has produced this report. Basically, this workplan proposed:

1. Considering the methods and findings of previous transportation studies;
2. Devising a unified plan to guide Commission activities;
3. Using a market matrix to organize the study (intercity, urban, rural, and international—passenger and freight);
4. Involving the public in issue determination and policy development;
5. Describing the existing U.S. transportation institutions and the use of existing services;
6. Defining and inventorying existing Federal transportation policies and programs;
7. Producing a unified set of forecasting models;
8. Choosing parameter values for the models by scenario development and surveys of technologies;
9. Reporting baseline forecasts by market, mode, region, and time period, with special concern for energy;
10. Determining resource needs to meet the activity forecasts;
11. Reporting revenue shortfalls and subsidy levels;
12. Developing new policies to resolve emerging issues;
13. Analyzing impacts of these new policies compared to the status quo;
14. Recommending ways to implement the policies through specific institutional channels during particular time periods; and
15. Responding to the congressional mandate.

Each of these activities required careful attention to proper methods. Although the chapters and appendixes describe such methods, NTPSC has compiled thousands of additional pages of supporting materials through the efforts of its staff and contractors. Table 130 shows for each chapter those supporting studies of direct relevance. Table 131 lists the workplan activities together with the chapters, appendixes, and reports that describe the activities. For example, the NTPSC reviewed hundreds of earlier reports to help define issues. These issues are developed in several chapters and in NTPSC Special Report No. 1, Volumes I and II.

For the activity listed in Table 131 as "Defining and inventorying existing Federal transportation policies and programs," the NTPSC researched and defined the often misunderstood concepts of goals, objectives, policies, and programs. The definitions are discussed in Appendix I, while the policies are described primarily in Chapter 2 and NTPSC Special Report No. 6. For the activity of "Developing new

TABLE 130. NTPSC chapters, appendixes and supporting special reports

Chapters	Related Appendixes and Special Reports
1. Transportation Functions, Institutions, and Activity in the U.S.	S.R. 7: Intercity Bus Transportation
2. Federal Transportation Policies and Programs	S.R. 6: A Compendium of Federal Transportation Policies and Programs; and Appendix I: Policy Definitions
3. State and Local Transportation Policies and Programs	S.R. 4: State and Local Transportation Policies and Programs
4. Comparative Transportation Policies in Other Countries	S.R. 5: Papers on Selected Transport Policies of Developed Countries
5. General Social and Economic Forecasts to the Year 2000	Appendix II: Comparative Social, Economic and Transportation Forecasts
6. Technological Trends in Transportation and Communications	S.R. 3: The Impact of Telecommunications on Transportation Demand Through the Year 2000; and S.R. 9: Technological Trends in Transportation
7. Transportation and Externalities	
8. Transportation and Energy	Appendix III: Alternative Energy Sources and Coal Movement Projections
9. Forecasts of Future Transportation Activity	Appendix II: Comparative Social, Economic and Transportation Forecasts
10. Capital Requirements for the Transportation Forecasts	
11. The Relative Price of Transportation to the Year 2000	S.R. 8: Federal Investment in Transportation: A Statistical Comparison; and Appendix IV: Government Accounts Computations
12. Emerging Transportation Issues	S.R. 1: Current Transportation Issues in the U.S.
13. Policy Recommendations	Appendix V: Mechanisms for Policy Development and Acceptance
14. Impacts of the Policy Recommendations	S.R. 2: Amtrak: An Experiment in Rail Service
15. Staging Policy Changes	
16. Summary and Conclusions	

TABLE 131. NTPSC chapters and supporting workplan activities

Workplan Activities	NTPSC Chapters and Appendixes
1. Considering the methods and findings of previous transportation studies;	ALL
2. Devising a unified workplan to guide Commission activities;	ALL
3. Using the market matrix to organize the study (intercity, urban, rural, and international—passenger and freight);	ALL
4. Involving the public in issue determination and policy development;	12, 13
5. Describing the existing U.S. transportation institutions and the use of existing services;	1
6. Defining and inventorying existing Federal transportation policies and programs;	2, 3, Appendix I
7. Producing a unified set of forecasting models;	5, 8, 9, Appendix II
8. Choosing parameter values for the models by scenario development and surveys of technologies;	5, 6, Appendix II
9. Reporting baseline forecasts by market, mode, region, and time period, with special concern for energy;	5 to 11, Appendixes III and IV
10. Determining resource needs to meet the activity forecasts;	10
11. Reporting revenue shortfalls and subsidy levels;	11, Appendix IV
12. Developing new policies to resolve emerging issues;	12, 13, Appendix V
13. Analyzing impacts of these new policies compared to the status quo;	14
14. Recommending ways to implement the policies through specific institutional channels during particular time periods; and	15
15. Responding to the congressional mandate.	16

TABLE 132. NTPSC chapters and reports related to the Pub. L. 94–280, Section 154 mandate

The Federal-Aid Highway Act of 1976 (Pub. L. 94–280) Section 154, Requires NTPSC Findings and Recommendations with Respect to:	NTPSC Final Report Chapters	NTPSC Special Reports
A. The nation's transportation needs, both national and regional, through the year 2000;	Ch. 1, 5 to 12	S.R. 1, 2, 3, 7, 9
B. The ability of our current transportation systems to meet the projected needs;	Ch. 5 to 11	S.R. 1, 2, 3, 7, 9
C. The proper mix of highway, rail, waterway, pipeline, and air transportation systems to meet anticipated needs;	Ch. 13, 14	S.R. 1, 2, 3, 7
D. The energy requirements and availability of energy to meet anticipated needs;	Ch. 8, 9, 10, 11, 14	S.R. 1, 2, 9
E. The existing policies and programs of the Federal government which affect the development of our national transportation systems; and	Ch. 2, 3, 7, 8	S.R. 4, 6, 8
F. The new policies required to develop balanced national transportation systems which meet projected needs.	Ch. 2, 3, 4, 13, 14, 15	S.R. 1 to 8

policies to resolve emerging issues," Appendix V describes the process used to bring alternatives to the attention of the Commissioners.

CONCLUSIONS

NTPSC RESPONSE TO THE CONGRESSIONAL MANDATE OF PUB. L. 94–280

As shown in Table 132, the NTPSC report is organized into chapters that support its six-part legislative mandate.

(1) The Nation's Transportation Needs, Both National and Regional, Through the Year 2000

The NTPSC determined transportation needs in three ways, using:

1. Issue investigations;
2. Examinations of earlier needs studies; and
3. Forecasting.

Needs which are unmet may precipitate issues. Issues were identified by the NTPSC through a literature search, a survey of transportation professionals and interest groups, and a series of public hearings held throughout the U.S. The results are summarized primarily in Chapter 12 and in Special Report No. 1.

Earlier needs studies, especially the U.S. DOT's 1974 *National Transportation Report* (as modified with unpublished data from the partial 1976 update and other sources), were used by the NTPSC to examine the plans of state and local governments and the private sector to provide investments to meet needs for transportation facilities and services. These results are described primarily in Chapter 10.

Finally, the NTPSC developed and used models to forecast needs through the year 2000 on a regional and national basis. The process and the results are described in Chapters 5 to 11.

Needs depend in part on the prices and availability of resources and cannot be regarded as simply an unconstrained "wish list." Although most persons would prefer that all needs are met (i.e., all transportation issues are resolved), both the scarcity of resources and the existence of competing needs makes such an eventuality impossible. Several of the NTPSC Special Reports (primarily numbers 1, 2, 3, 7, and 9) provide supplemental information about needs and resource constraints.

(2) The Ability of our Current Transportation Systems to Meet the Projected Needs

The NTPSC's scenario development and forecasting models provided estimates of the ability of the transportation systems to meet the projected needs, using baseline policies. Chapters 5 to 11 describe the scenarios, forecast models, and results. Chapters 1 to 4 and 7 describe the baseline transportation policies. Chapter 8 details the NTPSC energy policy assumptions used in its modeling. Together these chapters show how well the U.S. would fare using its existing policies under various possible future scenarios. Those issues that remain unresolved, or new problems that are seen to emerge, are summarized in Chapter 12.

Several of the NTPSC Special Reports (numbers 1, 2, 3, 7, and 9) provide supplemental information.

(3) The Proper Mix of Highway, Rail, Waterway, Pipeline, and Air Transportation Systems to Meet Anticipated Needs

The approach used by the NTPSC was to forecast the future mix (e.g., as between modes, passengers, and freight, regions, and public versus private ownership and operation) under baseline policies, and to examine those issue areas that signalled continuing or emerging problems in the future. The NTPSC policy recommendations of Chapter 13 then sought to resolve the issues with the least possible intrusion into private markets. The consequences of the new policies were discussed in Chapter 14, with an indication of the impacts on the mix of transportation, as well as on many other aspects of transportation. Thus, the "proper mix" is defined by the NTPSC to be as close as is practical to the mix that would be provided by private markets operating in a competitive atmosphere.

Several NTPSC Special Reports (numbers 1, 2, 3, and 7) provide additional information about what might be the proper transportation mix under various conditions.

(4) The Energy Requirements and Availability of Energy to Meet Anticipated Needs

Energy was singled out by Congress as of particular importance to transportation, because energy is both used and carried by transportation.

Forecasts of energy requirements, availability, and prices are given primarily in Chapter 8, although Chapters 9, 10, 11, and 14 provide additional information. In particular, Chapter 14 suggests what might happen to change these energy requirements, availability, and prices if the NTPSC policy recommendations are implemented. NTPSC Special Reports Nos. 1, 2, and 9 contain additional details about the relationships between transportation and energy.

(5) The Existing Policies and Programs of the Federal Government which Affect the Development of our National Transportation Systems

Federal institutions are discussed in Chapter 1 together with the private institutions that influence the operations of U.S. transportation systems. Chapter 2 discusses the complete array of Federal policies and programs seen to exist today, reflecting the original research of NTPSC Special Report No. 6. Chapter 3 adds a discussion of the interactions between levels of government that influence the effectiveness of Federal policies and programs. Environmental and energy policies are discussed in more detail in Chapters 7 and 8, while NTPSC Special Reports Nos. 4, 6, and 8 give details of Federal policies and programs.

(6) The New Policies Required to Develop Balanced National Transportation Systems which Meet Projected Needs

Chapter 13 provides the NTPSC policy recommendations, while Chapter 14 projects impacts of the new policies and Chapter 15 discusses their implementation. *Why* these policies are required depends on the data and analyses developed in all other chapters and NTPSC special reports. The NTPSC policy recommendations also propose that many of the existing national transportation policies and programs discussed in Chapters 2 and 3 should be retained.

CONCLUDING COMMENTS

The NTPSC has identified major problems involving current national transportation policy. Economic regulation has been too restrictive. Transportation and energy demands for capital may not be met under existing rates of return and levels of user fees. Solutions to the first problem are straightforward, although not easy, and implementation of the corrective policy contributes to solving the second problem. Thus, much less economic regulation of transportation is needed. For severe shortfalls of capital facing the railroad industry, relaxation of regulation can go a long way toward permitting the rail industry to develop its own capital sources. Coal movements spurred by effective U.S. energy policy choices can also contribute to the solutions.

Under present policies, the automobile costs of ownership and operation will continue to fall in relative terms (including government highway expenditures). Even though urban transit fares may likewise continue to decline in real terms, capital and operating costs (and hence deficits) are seen as continuing to accelerate. Highways will also experience capital shortfalls and declining service under current policies. User fees to reflect fully the costs of automobile and motor carrier use of highways would be unlikely to precipitate much change in aggregate motor vehicle use. On the other hand, urban transit fares sufficient to cover costs would reduce ridership drastically. Policies to finance accelerating urban transit and highway shortfalls must be tempered with procedures to increase productivity, through better management and labor practices and through application of proper economic analysis.

Given growing transportation demand, increased congestion, and capital shortfalls, attention should be paid to interconnections among modes. Each mode must be used to its greatest advantage, but, compared to present U.S. policy, much more must be done to promote the efficient use of these modes as interconnected systems of transportation.

The research reported above, and the material in the appendixes that follow, together with the NTPSC policy recommendations, are meant to facilitate the continuing evolution of national transportation policy.

Additional Views of Commissioners

COMMISSIONER GILBERT E. CARMICHAEL
and
COMMISSIONER GLENN M. ANDERSON

BACKGROUND

As part of its mandate, the National Transportation Policy Study Commission has analyzed the existing policies affecting transportation as it presently functions. These policies are evident in every segment of government. Social, urban, agricultural, and educational programs, among others, depend on some form of transportation policy. Many of the policies originate from laws and regulations which affect various government agencies and their programs, and are developed outside of the U.S. Department of Transportation.

The nation's goals can be loosely described today as mobility, growth, employment, and improved quality of life. Often, these goals have been supported through "unwritten" policies that had unexpected results. Prior to October 1973, the nation's goals were to a great extent achieved through the consumption of what was presumed to be an unlimited supply of cheap fuel and the movement of cheap raw materials to the industrial, financial, and population centers of the nation (and for that matter of the western world.)

One national transportation policy of the United States was to build highways to accommodate millions of big, relatively inexpensive, fuel-wasteful cars, which resulted in the movement of the population to the suburbs. Rather than connecting major cities, the Interstate system, with its beltways, circumvented them. Development consequently took place in the rural countryside at the exits. In fact, shopping centers which grew up at those exits are advanced versions of the old cross-roads store. They led to the development of new suburban towns around an old hub city. This eventually killed the center city.

Another aspect of our unwritten national transportation policy was to move energy (coal, oil, gas, and electricity) to the people regardless of the Btu costs. At present, raw materials are moved the same way. For example, a Mississippi bale of cotton may travel 1,000 to 5,000 miles before it is put on the spindle and turned into cloth, which is then shipped back to clothing manufacturing plants in Mississippi. The amount of fuel required to accomplish this has been ignored in the past because it was perceived to be in the best interest of the country to use the fuel.

Very little thought has been given to the most efficient use of energy. The nation's unwritten policy was to keep energy products such as gasoline and diesel as cheap as possible. The highway funds and state road building programs were based on a cents/gallon tax, thus making it necessary to increase consumption to produce more revenues to support or expand the road network.

Oil refining also was not based on the most efficient use of the Btu's in a barrel of oil, but rather on the most dollars in that barrel, based on artificial prices. Another example of Btu inefficiency is the fact that to make unleaded gas requires a greater percent of the energy in the barrel than to make the regular product. Data show that as much as 17 percent of the energy (Btu's) in a barrel is consumed in the refining process.[1]

About the kindest thing we can say about the pre-October 1973 era was that it was a gaudy, conspicuous, consumptive, wasteful, and polluting time. The nation had built a highly mobile society based on the unwritten laws of 1) cheap fuel, 2) consumption, and 3) waste. In these days of huge deficits (of dollars) a new value is coming into focus. A nation may spend extra dollars by printing more, but it cannot replenish its energy supply. Thus the need to budget energy becomes very real and critical. A new term similar to "cost/benefit ratio" in the world of money is easily restated as "Btu/efficiency ratio" in the world of energy. The question is: How does a nation budget its supply of Btus to produce the Btu/efficiency ratio desired? Once a country realizes it has a finite supply of energy, then the logical step is to use each Btu available to its optimum value. Once this is understood, a nation will think twice about the very energy expensive method of moving raw fuel or goods long distances to conversion or consumption points.

We now find our nation in a transition time from the "cheap energy" era prior to October 1973, to a new "expensive energy" era. This may help explain why existing policies do not seem to be working, and why our economy seems to be so irrational. Much of the inflation is not inflation at all, but simply the repricing of the world's energy and the resulting repricing of products that require the use of energy in their production.

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[1] Many oil suppliers in the 1950's were so sure that cheap nuclear power was on the way that they anxiously looked for long term contracts to use up their supplies of gas and oil before the new power came on line.

Attempts to preserve the old era are frought with danger. The challenge to the nation is how to build a dynamic economy based on the new implied laws of 1) higher priced energy, 2) conservation, and 3) recycling. *Relevant new transportation policies must reflect this new consciousness.*

BACKGROUND OBSERVATIONS

The Commission's final report meets its statutory mandate. It provides, in essence, a set of short-range policies to the year 2000, based on the needs of the present transportation system with its present infrastructure. We feel, however, that it is necessary to consider additional policies, along with the above supporting philosophy, which address the long-range transportation needs of this nation. These policies are important in that they support a transportation system that will produce economic growth, employment, and quality of life, but will protect environmental and social values, provide safety, and most important, promote energy conservation through Btu efficiency into the next century. In view of the changing nature of public policy-making in transportation (resource constraints, limitations on environmental degradation, etc.) decisions for the future are more complex than ever. Many of the decisions may involve greater levels of government control upon American freedom of mobility because of the need to reshape the transportation system as quickly as possible in order to conserve fuel and to keep a healthy economy.

The following premises represent the underpinnings for new transportation policies for the new era. Each has a distinct influence on the type and form of the future tranportation system of the United States.

First, there is a *limited* supply of fuel. Present transportation policy acknowledges this premise while ignoring the tough decisions implicitly mandated by such acknowledgement. Transportation, which is fundamental to the economy of the nation, must increasingly compete with other users and justify its need for its share of this limited supply.

Secondly, the country consists of fairly homogeneous geographic regions that have serious transportation problems peculiar to themselves. Present transportation policy ignores this fact and attempts to impose uniform guidelines upon a diverse nation. This approach has failed by not allowing each region to develop in the most appropriate and efficient manner to meet the needs of its population and industry.

Third, there is a need to take into account the changes that are possible in the type and form of transportation system available to the country. Present policy assumes that rail, highway, air, water, and pipeline transportation will continue to grow at current rates. It does not acknowledge changes that may result from research and development, nor does it consider innovations that are already beginning to have an impact, such as telecommunications for the transportation of information.

THE EMERGING TRANSPORTATION SYSTEM AND POLICIES

The policies which follow are designed for a better transportation system that must emerge in response to the above premises. This system differs from the present one. It is an "ethical system" in that it provides for growth and is Btu efficient. Energy would be "budgeted" on the basis of the most efficient use; waste would be reduced. Manufacturing and processing plants would be encouraged to move to the energy sites so that only semifinished and finished products would be shipped, cutting down appreciably on the net energy costs.[2]

The U.S. DOT and the emerging transportation system would be regionally oriented with the primary Federal role being to provide the resources to meet interregional needs consistent with national goals. For example, an independent National Resources Planning Board could be created to recommend equitable resource allocation and development policies to the Congress.

The following policies are essential for the development of the emerging transportation system discussed above.

(1) *Restructure the Department of Transportation (DOT),* for the new (high cost) energy era, so that it encompasses all modes in the four transportation universes:[3]

a) TRANSPORTATION OF PEOPLE for business and pleasure by highway, air, water, and rail.

b) TRANSPORTATION OF GOODS by highway, air, water, and rail.

c) TRANSPORTATION OF ENERGY by pipeline, rail, powerline, highway, and water.

d) TRANSPORTATION OF INFORMATION by cable (wire and glass fiber), microwave, and satellite.

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[2] For definition and explication of the term "net energy" see: "Energy-Costly Energy is Wasting Resources, Some Analysts Worry," *The Wall Street Journal,* May 3, 1979, p. 1.

[3] The NTPSC Subcommittee on Advanced Technology put forth the idea that transportation of information and energy may represent two further fundamental groupings.

This restructured DOT would disperse funds to the regions and promulgate rules on 1) safety, 2) environmental protection, 3) resource efficiency among the modes, and 4) research and development to improve the modes as well as to stimulate and develop alternative technologies to improve or substitute inefficient systems. The DOT would develop or implement policies which are primarily concerned with meeting interregional transportation needs, consistent with other national goals. For example, national transportation policy should be compatible with national urban policy so that decisions about the growth and direction of cities can be supported by the transportation system. The same is true of rural development policies. A National Resources Planning Board, not within DOT, might be responsible for such coordination.

(2) *Create a strong, regional transportation system to solve the peculiar problems of the individual regions.* Strong regional transportation offices of the restructured U.S. DOT, headed by Deputy Secretaries, would represent the Secretary of Transportation below the national level.

(3) *Economic deregulation and intermodal ownership* should be strongly encouraged to produce within the regional context the most fuel efficient and appropriate transportation systems. The government should allow intermodal ownership to take its course and should only intervene when the results are clearly contrary to the interest of the public.

(4) Individual modal trust funds[4] are contrary to the new concepts of intermodal ownership and regional decision-making. A national transportation trust fund should be created and allocated on a regional basis. *A national trust fund* would allow for innovative transportation development. Some localities might, for example, desire to build combination air-bus terminals to connect rural people with the new passenger transportation system. Some regions could find that the development of all-freight highways would best meet their transportation needs. Money from the trust fund would be provided through revenue sharing-type grants for work programs developed by the states and approved at the regional level.

(5) Petroleum fuels are so essential to the daily functioning of transportation operations that where practical, *petroluem supplies for transportation should be given first* priority. This does not relieve the transportation sector of its responsibility to reduce wasteful consumption of petroluem fuels. In this regard, the Congress may have to levy additional energy taxes. In addition, *domestic energy development should be accelerated.* Extensive research and development efforts should be undertaken to produce alternative fuels. Fuel should be allocated on a regional basis, based on a Btu-efficient energy allocation formula. This country should continue to buy foreign fuel and to hold a large percentage of newly discovered U.S. fuel in defense reserve.

(6) *Levy a variable fuel tax*[5] in support of the transportation trust fund. In order to do this, it would be necessary to remove all present forms of tax on fuel. Such a tax should be sufficient to cover the costs of promoting research and development, providing for maintenance and upgrading of existing transportation systems, and promoting conservation and allocation of the national fuel supply on a Btu-efficient basis.

(7) *Research and development* should be directed toward the rapid development and reshaping of a "balanced" transportation system in the following manner:

a) Use the domestic energy supply as cautiously as possible to achieve maximum efficiency in making the energy supply last as long as possible;
b) Stimulate research for alternative fuels and super fuel efficient engines and vehicles;
c) Stimulate substitution of modes or systems that cannot be made fuel efficient. For example, high-speed FAX[6] mail could replace much of the existing Post Office system.
d) Telecommunications should be stimulated to replace as much paper and people transport as possible.

(8) *International transportation policy* is different from domestic policy for both passengers and freight, and should reflect world rules and conditions so as to allow U.S. transportation systems, manufacturers, and suppliers to compete for world trade and travel on an equal basis.

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[4] Modal trust funds were established during the cheap energy era and were based on consumption. Trust funds for the year 2000 must reward conservation and efficiency to produce the best use of Btus available for a balanced system.

[5] One example of such a tax is the case of Washington State. Washington's variable fuel tax may vary between 9 and 12 cents per gallon. The tax is, in effect, a percentage tax in average retail sales which is set every 6 months. A national variable fuel tax would not necessarily be structured the same way but might employ similar concepts.

[6] Facsimile is the transmission of graphic material (such as a letter) electrically (wire or radio) and its reproduction. At present, a page can be sent anywhere in the U.S. (or many places overseas) in three seconds to six minutes, depending on the method and equipment used.

SENATOR JOHH H. CHAFEE

I would like to take this opportunity to congratulate our Chairman, Congressman Bud Shuster, for a job well done. His patience, cooperation, dedication and leadership have been valuable to the Commission. My Colleagues on the Commission should be commended for dedicating their time and effort to this study. Also, I would like to extend my appreciation to the staff members whose hard work was indispensable to the completion of this review of national transportation policies.

One of the high points of my experience on the National Transportation Policy Study Commission was to plan and chair a New England Regional hearing in Providence, Rhode Island on November 17, 1977. Congressman Bud Shuster, Commissioners Gilbert Carmichael and James McConnon, Public Members of the Commission also attended.

These hearings allowed me to gain a better understanding of the transportation problems of the "real world". The problems of accessibility for handicapped persons were brought to light; the need for an upgraded rail system in the Northeast with more access for commuters was suggested; and Mr. Charles Butler, President of Air New England, informed us of the problems that the smaller commuter airlines have in meeting the demands for safe, frequent and dependable feeder-type air transportation linking its smaller cities with the hub cities of Boston and New York.

One of my concerns for the future of transportation in the United States is the issue of energy as it relates to transportation. I would like to focus on the key results of the Commission's findings as reported in the forecast chapters—especially the energy chapter—that, in my opinion, have *not* been brought forward into the policy chapters. Because of the crucial interdependence between transportation and energy and because of the critical role that both play in the nation's health, well-being and even survival, it is important to draw these out. In doing so, let me commend the effort that developed these regional energy-transportation forecasts. As I understand, this is the first forecast with this level of detail.

As is true of some other areas of the country, New England is not blessed with abundant petroleum resources. Therefore, we in New England must seek to share interregionally those scarce resources while at the same time promote appropriate regional energy development with an environmental concern. For regions with fewer fossil resources like coal or oil, conservation should play a vital role. The forecasts demonstrate that New England will lead the nation in achieving fuel savings in transportation and other sectors. Because of its size, geography and pockets of high-density population, New England can become a show place for intercity mass transit through car pools, vans, buses and trains.

It is my hope that this study's recommendations will prove useful, and that its thought-provoking ideas will contribute to continued serious discussion of transportation policy matters in the crucial decades ahead.

COMMISSIONER R. L. "DICK" HERMAN

The Commission has recommended an integrated set of national transportation passenger and freight policies which are predicated on a number of major policy themes (Chapter 13, Policy Recommendations). I have endorsed and strongly support both these policies and the underlying themes that support them. The Commission failed, however, to recommend establishment of a Railway Trust Fund, or at least to recommend that the Trust Fund be given further study. In this instance, the Commission has been inconsistent. I consider this omission of sufficient significance to merit these supplemental remarks.

Two major policy themes underlying national transportation policies were identified by the Commission. They are (1) "national transportation policy should be uniform" and (2) "users and those who benefit from Federal action should pay". While uniformity is not desirable for its own sake, policies should be even-handed. A Railway Trust Fund would go a long way toward eliminating present policies that work at cross-purposes.

In the case of highways, the Commission approved the Highway Trust Fund which accounts for collections of user taxes imposed on such items as fuel, lubricants, vehicles and parts. The Surface Transportation Assistance Act of 1978 (Pub. L. 95–599) requires the Secretary of Transportation to conduct a Highway Cost Allocation Study to determine, among other things, the costs of the use of Federal-aid highways by different vehicle classes. Similarly, the Airport and Airway Development and Revenue Act of 1970 (Pub. L. 91–258) established taxes for users of the airways and directed a cost allocation study which was transmitted to the Congress in September of 1973. Last year, Congress enacted the Inland Waterways Revenue Act of 1978 (Pub. L. 95–502). It established a new Inland Waterways Trust Fund to account for fuel tax collections to be paid by users of the Federal waterways, beginning in 1980. Again, Congress required a cost allocation study to determine the costs and benefits attributable to the various beneficiaries of Federal expenditures on the country's inland waterway system.

The policy theme was consistent—users and those who benefit from Federal action should pay their fair share of costs or value of benefits. In the case of trucks and airlines, Congress directed studies to determine if fair shares are now being paid. Charges to waterway users would be started gradually. In my view, developed river segments that have the ability to pay (full year operation, adequate river capacity and adequate traffic) should be guideposts for full cost recovery. Undeveloped segments could pay for proportional recovery; a fuel tax credit should be applied to prevent cross-subsidies.

The important fact is that Congress has enacted legislation to recover Federal expenditures for all modes of transportation except railroads. Furthermore, it has required studies to determine the amount of recovery for each class of user. The question then becomes, why are users of railroads exempt? Establishment of a rail trust fund to identify Federal benefits and provide a method for assessment and collection of rail user charges would go a long way toward correcting this inequity. In all probability, this could become more important with the passage of time as Conrail or railroads in similar circumstances need additional Federal assistance.

At the Commission's meeting on April 25, 1979, the question of a Railway Trust Fund was discussed. Commissioner/Congressman Gene Snyder (Rep., Ky.) read into the record a statement pointing out that railroads receive many kinds of Federal aid. Specifically mentioned Federal payments were: contributions to the Railroad Retirement Fund deficit; direct grants to trustees of bankrupt railroads to permit continued rail service, for rehabilitation, and to pay creditors; purchase of Conrail perferred stock and debentures; payments to eliminate railroad-highway grade crossing; and payments for properties of bankrupt railroads taken over by Conrail. The Statement also reported, "All told, Federal capital assistance over the last 20 years totals approximately $8 billion, of which there is little prospect of recovery for some $5 billion."

The Commission was not unmindful of the problem I address here. The Final Report contains this statement: "The 'user-pays' principle should also apply to the rail mode." (Chapter 13, Policy Recommendations). For myself, I would go further, and recommend establishment of a Railway Trust Fund similar to the other modes, or at least recommend that the Congress direct a study of the situation.

Finally, while I differ from the majority of my fellow Commissioners on this particular issue, it would be inappropriate of me to close without reference to the support of other Commissioners on a number of matters that I consider to be of great importance, which were adopted as policy recommendations. I will limit these remarks to just two: first, the recommendation for establishing a zone of reasonableness, subject to antitrust laws, which provides needed pricing freedom to all for-hire carriers; second, the recommendation that would require motor carriers, as a condition of the right to operate, to demonstrate to proper authority that adequate insurance (or proof of equal financial responsibility) has been provided to protect the public, and that the Federal heavy vehicle highway use tax has been paid.

Policies recommended by the Commission for motor carrier regulation would result in some problems. They would ease entry into certificated common and contract carriage, and provide regulated carriers with pricing freedom within an expanding zone of reasonableness to be established by the Congress. These policies open the highways to additional truckers, thereby increasing the risk of accidents, and accordingly, the incidence of personal injury and property damage. In addition, the new rate freedom is likely to intensify price competition, a goal of deregulation. It is also likely that some carriers, if pressed financially, will be tempted to cut corners in the area of safety. Thus, the impact of either or both of these policies may have serious consequences for the public. Additional safeguards to life and property on the highways are clearly needed.

The recommendations of the Commission forthrightly address this problem. To register their vehicles and obtain license plates in one or more states, all carriers must pay the Federal highway use tax (a portion may be retained by the states to cover the cost of collection). But more important, all motor carriers must show they have existing insurance (or equivalent financial responsibility)—covering public liability, property damage, cargo (for other than private carriage), and environmental restoration. Certificated carriers must show they have minimum coverage of $1 million, single occurrence, or some other minimum amount sufficient to require periodic "on site" inspection by an insurance company.

All in all, the recommendations of the Commission have covered what I believe to be the major concerns of the transportation industry to the year 2000, and I am pleased to support the final report in this regard.

CONGRESSMAN JAMES L. HOWARD

May 11, 1979

The Honorable Bud Shuster
Chairman, National Transportation
Policy Study Commission
2000 M Street, N.W.
Washington, D.C. 20036

Dear Mr. Chairman:

The National Transportation Policy Study Commission is at the point of fulfilling its Congressional mandate. I am pleased to observe that as Chairman of the Commission your leadership has been well-organized, resourceful, dynamic and inspirational, eliciting the best of the Commissioners' talents.

Mr. Chairman, I commend you and my fellow Commissioners on the intensity of your labor, and theirs, and on the quality of the Commission's final report. Accordingly, I respectfully request that the record include my affirmative vote in approval of the issuance of the Commission's final report.

My approval of the report, however, should not be construed as approval of all of its specific recommendations. As Chairman of the Subcommittee on Surface Transportation of the Public Works and Transportation Committee, I will have to chair its Members' consideration of many of the very issues considered by the Commission. For example, the Subcommittee on Surface Transportation will oversee and consider legislative proposals regarding the whole gamut of economic motor carrier regulation, the relationship of transportation to energy resources (and this of necessity will include the whole question of financial support, including taxes, of all modes of transportation within our jurisdiction), and other vital transportation issues confronting our nation. I fear the genuineness of my objectivity may be open to question if at this time I endorsed specific recommendations on matters yet to be considered by the Subcommittee. Therefore, I ask that my approval of the report's issuance not be considered an endorsement of all of its recommendations and I respectfully request that this letter be included in the report. It cannot be denied, however, that the quality of the Commission and of its report is such that all its recommendations must bear substantial weight in all the Subcommittee's deliberations and recommendations and in the deliberations of all legislative and policy-making bodies.

Every best wish.

Sincerely,

/s/ James J. Howard
James J. Howard
Chairman, Subcommittee on
Surface Transportation

SENATOR RUSSELL B. LONG

INTRODUCTION

I wish to commend the Commission and the staff on a job well done. In the interest of completeness, I would like to add the following views.

NEED FOR LONG-TERM LOOK AT TRANSPORTATION AND ENERGY

I feel the key findings of this report in the "forecast" chapters have not been included in the policy chapters. Because of the crucial role of transportation and energy to our nation's health and safety, I feel it is extremely important to spell out the concerns and impacts on our future policy decisions. This is important because transportation and energy play a vital role in our economy. Also, decisions to improve them require large sums of money, and perhaps as long as 20 to 25 years. This is not an extreme period of time by transportation and energy standards.

As pointed out in the forecast chapters, transportation and energy play a dual role. Transportation provides the facilities to move needed energy quantities—both old and new. Similarly, energy, as a fuel, is the lifeblood by which transportation makes possible a great degree of our economic strength. Policy decisions in transportation that do not recognize the adequacy of fuel for transportation are not rooted on firm ground.

IMPLICATIONS OF FORECAST

I understand the development of an integrated transportation and energy forecast capability is a first stage of a regional system needed for future policy decisions. I strongly suggest this effort continue so the public can benefit.

Two overriding themes emerge from the forecast. First, our transportation system structure must be upgraded and maintained to enable it to move the domestic energy required to meet our future energy needs. This will require substantial funding. Second, we must strongly develop domestic fuels for transportation, which are vital for economic survival. This means increased domestic production of crude oil, rigorous development of alternative "petroleum-based" sources (coal and shale oil) and renewable liquid fuels (alcohols from biomass, solid waste and coal). In transportation, there must be rigorous development of fuel-efficient (and safe) vehicles. Since the forecasts indicate the growing reliance for passenger movement on the auto and the airplane, which use most of the transportation fuels, they must be as fuel-efficient as possible.

While observing these vital needs, we still must take into consideration the nation's concerns over the environment.

SPECIFIC RECOMMENDATIONS

- Continue development of the ability to forecast future transportation and energy needs.
- Provide needed *domestic* liquid fuels for *transportation needs* from many sources to *reduce foreign imports.*
    - expanded domestic petroleum, especially Alaska and lower 48 traditional areas
    - develop synthetic crude from coal and oil shale
    - develop synthetic alcohols from biomass, solid waste, and coal (e.g., gasohol)
    - develop alternate fuels, such as synthetic gas (from coal), geo-pressurized methane, and solar that will free up petroleum-based fuels for transportation purposes (from forecast chapter 8).
- *Develop* and maintain *needed* transportation *capacity* to handle *new expanded* domestic fuel movements—especially for movement of coal (for power and industrial use) and for synthetics developed from alternate feedstocks—especially the removal of potential regional bottlenecks in the waterways transportation network occurring post 1985 (from forecast chapters 8 and 9).
- Develop and rigorously promote the commercialization and usage of fuel-efficient autos, trucks, and aircraft (promote energy-efficient technology) (from forecast chapter 6).
- Streamline regulatory bottlenecks for:
    - coal development, movement, and usage
    - synthetic fuel development
    - domestic refinery siting requirement

  so that anticipated transportation demand can be met with domestic energy (e.g., multi-permitting process for site selection for alternate fuel development) (from forecast chapters 7, 8, and 9).
- Development of *fiscal* incentives to generate the large amounts of money projected to be needed—both public and private—to develop needed transportation and fuel development (from forecast chapters 8 and 9).
- Development and scrupulous evaluation of risk assessments of environmental, health and safety factors associated with alternate fuel developments, movements of fuels, utilization of fuels, and disposal of fuel wastes (from forecast chapters 7 and 8).

SENATOR LARRY PRESSLER

At the outset, I wish to commend Chairman Bud Shuster, my fellow commissioners, and the entire commission staff, for the excellent job they have done in developing and publishing this very timely document. My only regret is that my appointment to the Commission earlier this year, came too late to allow me to make a more meaningful contribution to the body of this report. It is primarily for that reason that I have sought this forum to state the views of an elected official from a predominantly rural, agricultural and sparsely-populated state.

In the ideal marketplace envisioned not too long ago by Adam Smith, transportation, like other services, would be provided to the extent that they are profitable to the transport owner. However, as every reader of this report knows, we do not have an entirely free economic marketplace in the United States. In fact, we haven't had anything close to such an ideal for over 50 years, nor are we likely to have it in the near future. Therefore, we must act prudently when recommending transportation policies through the year 2000, since it is simply impractical for us to act otherwise.

There are several very significant events (which only in retrospect, may loosely be characterized as acts of "transportation policy") that have largely shaped the transportation infrastructure in existence today.

1. Nearly 100 years ago, the Federal government began to regulate rail transportation, which was then the predominant mode of transport.
2. Over 60 years ago, the Federal government began to assist the states in developing a farm-to-market road system, to help the nation's farmers get out-of-the-mud.
3. About 50 years ago, the Federal government acted to support a fledgling aviation industry, and to protect an emerging motor carrier industry from possible takeover by the then, still dominant, railroad industry.
4. While these new major modes of transport (air and motor carrier) were being protected and nurtured towards their eventual maturity, the Federal government continued to maintain, improve, and expand a modern inland waterways system.
5. Since the end of World War II, the states, both on their own and in conjunction with a massive Federal-aid highway program, have developed the most extensive and modern nationwide road network ever built.

In retrospect, these major transportation events were probably more influenced by the political realities of the day than by the economics of the marketplace. In fact, the sheer magnitude of some of these transport programs has contributed largely to many diseconomies in the transportation marketplace. Examples of such diseconomies include the following situations:

a. Prior to the Great Depression, nearly all public transit was privately financed and operated. By the early 1960's, new urban highways contributed significantly to the depopulation of our central cities and competed directly with public transit. These new highways literally forced every major transit system from profitable, private ownership to subsidized, public management.

b. Federal development of the national airspace system both stimulated and generated commercial air travel to such a degree where this mode virtually supplanted all business and much leisure intercity travel that had, heretofore, been almost entirely served by our pervasive, national rail network.

c. The (near) completion of the Federal-aid interstate highway system, supplemented by many state turnpike roads built in the 1950's, significantly contributed to the diversion of high-value (and profitable) freight traffic from rail to motor carriage.

We now have a transportation market where:

1. Air transport relies solely on Federal assistance for safety and control systems, not to mention aviation research and development largely initiated by the U.S. Air Force and/or NASA.
2. Motor carriage is totally dependent on the Federal-aid highway, and local street and road systems.
3. Public transit is heavily subsidized at all government levels for operations, while its capital programs receive massive Federal grants.
4. Inland water users (until only recently) paid nothing to ply a system totally maintained and improved with Federal funds.
5. Intercity rail passenger service is operated by a federally-created corporation. Passenger contributions for operating costs average only 37 percent, while all capital costs are assumed by the Federal government.
6. The rate of return for the entire railroad freight industry is so low that the Federal government has become the lender of last resort for many rail carriers today.

Given the historical transportation events cited earlier, and given the litany of heavy Federal involvement in virtually every mode of transportation as shown above, it should be clear to even the casual reader that today's marketplace is nowhere near the ideal marketplace that many of us on the Commission would like to see.

Therefore, we must deal with the realities of today when presenting recommendations for transportation policy through the year 2000. The facts that we must recognize today are:

a. Our nation is no longer self-sufficient in transport energy, whose requirements exceed half of our petroleum consumption.
b. The above lack of energy self-sufficiency is the principal factor in the hemorraging of our national wealth to foreign countries, many of whom are unfriendly to us.
c. The critical export item that helps to alleviate our current, intolerable imbalance of trade comes from rural, sparsely-populated states who are among the most efficient food-growing areas in the world.
d. It is certainly not in the best interest of this nation to encourage further depopulation of our rural areas towards crowded urban areas, which already contain so many people who require extensive public support for every facet of life (i.e., food, health, and housing assistance).

In the light of the facts cited above, it is simply inconceiveable that any transportation policy be recommended which in any way inhibits the production of valuable, exportable agricultural commodities.

The number of agricultural workers, as a percentage of agricultural consumers, is continually decreasing primarily because of increasing efficiency in the agriculture industry. As a consequence, I find it unacceptable to expect today's agricultural producers to pay still more for the transport of their greatly needed products. Therefore, I take great exception to the extent that this report suggests that the agricultural producers of sparsely-populated grain states increase their transport costs to move agricultural products, whether by rail or truck, when it is precisely the sale of these products abroad which so greatly improves our national balance of trade.

The citizens of all farm states currently support multi-billion dollar public transit programs, which hardly serve farmer-citizens. They support an equally costly national airspace system, which at best, serves rural areas infrequently. My own state has never even been served by Amtrak!

While I certainly encourage the thrust of the Commission's approach to the recommending policies that would return us to the marketplace and let the economic forces therein largely determine our nation's transportation actions, I must dissent from any recommendtions that place additional transport cost burdens on a relatively small, but highly productive segment of our people.

I am confident that many of my fellow Commissioners would support my position. Since my tenure on the Commission, which was created in 1976, has only been three months, the press of senatorial business has prevented me from actively seeking their support for my position. This I regret.

Finally, I am grateful to my respected Congressional colleague, Bud Shuster of Pennsylvania, for extending to me the courtesy of incorporating my additional comments to this very important report.

I commend him on his successful leadership and direction in recommending approaches to one of our nation's most vexing issues: national transportation policy.

CONGRESSMAN GENE SNYDER

Over the last two years our committee has studied and debated the various aspects of making certain our country has an adequate transportation network serving our nation in the year 2000 to meet the distribution needs of our citizens.

This effort has been one of extreme complexity but, hopefully, we have shed some light on the subject that will be of benefit to those involved in the transportation of products. I believe my fellow members in Congress will find it useful in oversight hearings when studying the problems of moving people and goods from one place to another.

The most vital theme of our work, I believe, was to promote competition. Not destructive competition, but healthy competition between and within modes to assure a choice to shippers and consumers. Competition should allow the transportation mode which can do the best job at the most reasonable price to participate in the traffic. Inherent advantages of a particular mode should prevail if our citizens are to enjoy the blessings of an efficient distribution network which presently sets us aside from most of the other countries of the world.

The advantages of steel rail, a concrete roadbed, a flowing pipeline, an improved waterway, or three-dimensional airspace, all have their places and inherent superior benefits. The advantage may be over the entire movement of a product or may be for just a segment of it. Hopefully, a government policy will promote the use of the most efficient carrier over a given segment, and will assist in intermodal cooperation and coordination rather than a confrontation policy which only leads to destructive practices to the detriment of our overall transportation system.

In promoting competition, our Commission supported a policy of lessening government regulatory intervention into the affairs of the various modes; however, we believe the concepts of present antitrust policy should prevail, including their treble damage deterrents, when any phasing out of economic regulation occurs. In order to serve the transportation needs of all the distant regions of our country, we cannot recommend policies which would repeat the history of monopoly power which caused our lawmakers to set up burdensome regulatory bodies in the first place. As long as human nature is involved, I believe there will always be a need for an oversight review of the practices of our various transportation entities. We must continue to oppose non-competitive practices, whichever mode may engage in them, such as using the power of a monopolistic route to subsidize a non-profitable route in order to eliminate a competitor by engaging in some type of predatory rate cutting. Our debate recognized this problem and I only emphasize our concern.

When the Commission was set up, I was disappointed that there was not a broader spectrum of public members. Though I believe the congressional members were well balanced to reflect all the varying concerns we addressed, I feel certain segments of our economy did not have an advocate to reflect the views we needed for a balanced final product.

For instance, sadly lacking was shipper representation. Throughout our NTPSC deliberations, we continually talked about the health of *carriers,* but rarely did I hear about the *shipper's* point of view.

Many industrial plants throughout the nation have located where they presently are situated because there was a known transportation policy which would provide them with rates to move their products at a reasonable cost, and there was an assurance they would receive the necessary service to move these products.

It disturbs me to think that many of our nation's farmers, and many of our factories located off the beaten path, will no longer receive service, or only receive it at an exorbitant rate, if we radically change our transportation policy.

We have evolved, rightly or wrongly, a transportation policy over many years. Now, in the name of correcting certain misapplications of law, regulations, or policy decisions, which have caused a deterioration of the railroads in some areas, airline competition in others, and certain built-in deficiencies for every mode, we may find ourselves back in a different commission debating on a three year study of correcting the farm policy, or the steel policy, or the widget policy, due to transportation problems that we may cause by our decisions.

Also, though we had a Commissioner in the early part of our deliberations who was from the aviation sector, he resigned and the airline industry was not represented in the final critical review stages of our report.

There was never a public representative of the maritime industry, neither from the deep sea, Great Lakes, or rivers, who would have had a vital stake in our deliberations.

Though the pipeline had a representative through ownership by a railroad company Commissioner, I believe his main concern was the railroad industry's position rather than the pipeline's point of view. Additionally, there was no one from labor or any one person representing the views of the consumer, except those of us from the public sector serving our constituents.

It is unfortunate that, though we took public testimony throughout the country, we did not have on the Commission itself public members whose knowledge would have given us insight and answers to questions we had regarding the interface of the differing modes. Hopefully, any deficiencies to which we may not have given proper attention will surface from those knowledgeable in their field when we enter into any deliberations within the congressional committees debating the transportation policy and they can be addressed in depth at that time.

Transportation is a service industry and has been given privileges over the many years while it was required to perform a common carrier service for the public. We must be sure that the privileges are recognized as also entailing responsibilities to the public to provide an adequate, reasonable, but also profitable service in return. I hope the policies our Commission has outlined will do this and I shall be monitoring the results during my tenure in Congress.

SENATOR JOHN TOWER

As the Commission's report makes clear, the study of national transportation policy is hardly a new endeavor. For centuries, Federal officials and other interested parties have frequently investigated the Federal government's role in transportation and the effects of transportation on other national policies. By necessity, in defining policy, one must consider broad objectives and goals. The focus is wide rather than narrow because we are dealing with very large issues rather than specifics which are aimed at carrying out these objectives.

One of the major policies in the report about which I am particularly concerned is that there should be an overall reduction in Federal involvement in transportation programs. The report concedes that the Federal government has an important financial role in transportation, but I fervently believe that in many instances Federal involvement can and should be reduced so that private enterprises can function effectively. I subscribe to the principle that the private transportation sector should be permitted and encouraged to meet changing economic and other requirements without being unduly restrained by Federal laws and rules that do not apply to other business sectors. For most transportation issues, public interest and private profit are consistent rather than at odds. Generally speaking, the public interest is best served by decentralized private decision-making, and not one involving centralized government decisions that respond largely to bureaucratic and political imperatives.

It is incumbent upon members of Congress to pursue transportation poilicies that are consistent with economic reality. While the Commission's report is long on generalities and short on specifics, I would like to cite one illustrative example of existing legislation which impedes the accomplishment of the policy objective of reduced Federal intervention in transportation matters.

It is my privilege to sponsor legislation now pending before the Senate Committee on Banking, Housing, and Urban Affairs, that would carry out the NTPSC recommendation for reduced Federal involvement by repealing the Davis-Bacon Act as that Act applies to federally assisted public transportation programs. As a member of the Committee on Banking, Housing, and Urban Affairs, I have great concern about the wasteful effect which the Davis-Bacon Act has upon Federal spending in public transportation programs, and I believe that its repeal is essential if we are to control Federal spending in this area.

The Davis-Bacon Act, which as enacted during the 1930's, requires construction contractors engaged in federally assisted projects costing over $2,000 to pay their workers at wage rates determined by the Secretary of Labor. The Secretary's determination is supposed to reflect the wage rates prevailing for similar types of workers in the community where the project is located. The purpose of this Act was to prevent contractors from using so-called "itinerant" workers from outside the local community to work on federally assisted projects at lower wage rates than prevail in the community. The concern is that this would undercut the wage rates of local construction workers. The problem is that this inflated the wage rates which contractors must pay their workers on federally assisted projects. As a result, the American taxpayer has had to foot the bill for the higher costs of federally assisted construction. Moreover, the Davis-Bacon Act is disruptive to the private wage scales of many contractors and has discouraged many of those contractors from bidding on Federal projects.

The Davis-Bacon Act applies to federally assisted public transportation projects by virtue of Section 13 (a) and (b) of the Urban Mass Transportation Act, as amended. Because of the substantial costs necessarily involved in any significant construction project involving public transportation, it is obvious that the effect of the Davis-Bacon Act provision is substantial.

The Davis-Bacon Act is an Act whose time has gone. Even if the Act were administered in accordance with the original congressional intent, it would have no place in our present economy. But the problems engendered by the Act as it is actually applied by the Department of Labor lead to an outrageous misuse of Federal resources. Clearly, this legislation violates both the letter and spirit of the NTPSC report.

I continue to be an advocate of meaningful Federal support for public transportation, and I believe that public transportation programs can play a vital role in addressing a number of urban problems including congestion, energy consumption, and the environment. However, it is critical that Federal expenditures in this area not be wasted, and elimination of the artificial barriers of the Davis-Bacon Act is essential if we are to serve the interests of the tax paying public.

If we are really serious about dealing with inflation while remaining true to our commitment under the policy recommendations in the NTPSC report, there is not a better place to begin than by repealing the Davis-Bacon Act, as it applies to federally assisted public transportation programs. I intend to pursue this matter vigorously during the 96th Congress and look forward to its prompt and favorable consideration in the near future. By offering this specific step, it is my purpose to fulfill the policy objectives set forth in the NTPSC report so that our nation can benefit from an efficient transportation system based on free market principles unhampered by the heavy hand of counterproductive legislation and other Federal intervention.

COMMISSIONER WILLIAM H. TUCKER

This Report of the National Transportation Policy Study Commission makes many very substantial contributions to the ongoing process of developing effective, rational, and coherent policies to meet the transportation needs of this nation. I believe that it provides a most useful analytical framework for weighing competing objectives and interests, and for reaching informed policy decisions. I hope that it will also serve as a catalyst for achieving needed improvements both in the operation of the transportation system itself and in the statutory framework under which it operates.

In particular, the findings in critical sociological, technological, environmental, and energy problem areas—discussed throughout the report—will be of considerable use to the Executive and Legislative branches in the years ahead. Moreover, a substantial volume of supplemental papers in a wide range of subject areas was developed by the Commission's expert and highly dedicated staff. These should also prove to be especially useful.

In my judgement, however, our Report is noticeably deficient in articulating lucid policy objectives in several areas of central importance to the Commission's overall mission. By failing to come fully to grips with difficult and often contentious policy issues in transportation regulation and modal coordination, and by failing to relate recommendations in the report to broader societal forces which can be expected to dictate future transportation needs, the document runs the risk of being construed more as a defense of the status quo than as a blueprint for genuine reform. Such a defense was hardly the import of the Commission's initial deliberations. The limited, scattered new policy proposals which our Report does offer, and the mere suggestion that change is in order, do not, in my view, fulfill the Commission's statutory mandate to ". . .recommend those policies which are most likely to insure that adequate transportation systems are in place which will meet the needs for safe and efficient movement of goods and peoples."

Concern over these and related issues, and the forces which produced them, prompts this separate expression. Its purpose is to direct attention to issues which the Report glosses over in disturbing ways.

This Report, the product of 2-1/2 years of hard work by the Commission and its staff, appears against the backdrop of what is undoubtedly the broadest public debate on issues of surface transportation regulation since the controversy which preceeded the beginning of motor carrier regulation in 1935. Indeed, the establishment of the Commission itself, in 1976, is at least partially reflective of Congress' intention to provide an independent, impartial forum in which these very issues, not then deemed fully ripe for legislative consideration, could be studied, debated and evaluated. Our failure to confront these issues—and in particular, to measure their relative importance for the nation as a whole—does not do justice to the Commission's mandate.

The approach which a Federal study commission must take in attempting to identify where the public interest may lie in a given set of issues is functionally distinct from the way in which that interest may be said to emerge in legislative enactments or even in the decisions of independent regulatory agencies. This is intentional. The mechanism of a study commission is expressly designed to afford maximum intellectual freedom to weigh and to judge the full scope of the public interest. It cannot be, exclusively, a forum for the clash of competing economic interests, nor serve as a megaphone for particular groups who may feel threatened by the potential direction of Federal policies.

A national transportation policy study commission must, instead, serve as a vehicle for the development and transmission of ideas whose impact will be felt long after the particular interests of individual participants have ceased to be of great importance. In a technologically evolving society such as ours, new visions are bound to render irrelevant a number of the assumptions of which we are so protective today. It is the responsibility of a study commission such as this one to anticipate these developments and to assess their import for current policy decisions and for future policy directions. In this regard I endorse the fundamental concerns so ably expressed by my colleagues, Commissioners Carmichael and Anderson.

The dominant characteristic of the present controversy is the solemn determination of various interests in many segments of regulated transportation industries to preserve a system of regulation by, in effect, government-sponsored cartels. Such sentiment is noticeably prominent in the trucking industry. Indeed, it has historically been the case that the more susceptible a particular transportation mode is to competition from new or existing business entities, the more vocal its demands for governmental controls which afford welcome insulation from natural market forces. All of these demands—for limits on market entry, for minimum rate controls, and for collective action in ratemaking—are made in the name of the public interest. However, the validity of these concerns depends on the market economics of the particular industry areas. If it is highly competitive, as research on motor carriage suggests, controls to limit competition are not in the public interest. At a minimum, an independent Federal study commission should be expected to determine whether and how regulatory protection from genuine and fair competition continues to be justified.

The Commission has done little, however, in this regard. We have wholly failed to integrate the thoughtful and highly significant forecasts into the ongoing policy debates. We have sought, instead, to travel well-worn paths, to relitigate issues moving toward resolution in other forums, and to provide additional fodder for one or another side of these debates. We have done precious little, in my judgement, to provide unique insights into considerations not fully explored by others, or to advance reasoned analyses of controversial issues.

When I assumed my duties as a member of this Commission, in May of 1978, I had been given to understand that the Commission had already evinced an institutional commitment toward reliance on competitive market forces in transportation industries as a means of effectuating needed reallocations of modal resources. Regulation, most Commissioners had come to believe, was warranted only to rectify particular abuses in the marketplace that were readily demonstrable and clearly understood. Indeed, it was thought that many of the enforcement mechanisms already available in the antitrust laws could accomplish these ends. The value of the Commission's work would ultimately be judged by how well it charted these newer waters—not by how faithfully it parroted the current debate. In this regard, too, we have failed rather seriously.

I do not view overall commitments to less governmental involvement in some areas as being inconsistent with the development of new policies in other areas to preserve essential services, or to assess to users those charges directly attributable to them. Yet, our preoccupation with modal regulatory issues restricted our ability to address fully particular problems in these other areas and to develop long-range programs to remedy them. For example, the Report's attitude that responsiblity for the problem of Amtrak and Conrail lies elsewhere only delays serious consideration of the long-range issues affecting these entities. Failure to critically reexamine the entire Amtrak system only exacerbates uncertainty over its usefulness in the context of overall energy policy and national defense. Failure to take a hard look at Conrail's present structure and operations leaves unanswered equally troubling questions about future governmental policies in rail freight transportation. There are other gaps in the report of a similar nature. For example, the burgeoning problem of access to and usage of major air terminals in the country must be addressed now if we are to meet the visible and increasing problems in this area which even now are reaching crisis proportions.

It is tempting to engage in extended debate on particular policy or program challenges in these and other situations, but to do so would obscure the more fundamental failings of the report as a whole. Its basic deficiency in articulating any comprehensive long-range policies, as outlined above, can be observed in four major areas:

- Failure to resolve modal development priorities;
- Failure to examine the major structural dissimilarities between modes, and to gear policy recommendations to them;
- Failure to assess the differing long-range impacts of deregulation on the different modes; and
- Failure to articulate clear resolution of user fees allocations.

1) MODAL DEVELOPMENT PRIORITIES

The inherent advantages of particular transportation modes cannot be assessed in isolation. A broader framework, one containing supravening economic and social policy objectives, is necessary for such evaluations to have any real validity. The tentative and superficial nature of the Commission's recommendations in this area can be directly traced—as Commissioners Carmichael and Anderson point out—to the absence of any such framework.

The starting point in any analysis of modal advantage or effectiveness must be: What are the most efficient and cost-effective means for moving people and freight? In contrast to other studies, the Commission recognized this at the outset as well as the acccompanying challenge to establish related policies that would contribute to the best possible transportation system—a system within the framework of foreseeable energy and environmental requirements. This approach was not adhered to. However, it is the Commission's task to keep its gaze upon the horizon, and not to let the pull of special interests obscure its vision.

The transportation policies recommended by the Commission are not rooted in any firm consensus on their implications for broader concerns, such as energy and environmental policy. As a result, the focus of the Commission's report is largely the question of how best to protect existing modal gains. Such considerations, although important, should not have been allowed to predominate.

2) REGULATORY POLICIES

As with modal development priorities, the regulatory policies for differing transportation modes should be determined by reference to a framework of broader societal goals. Lacking any such framework, regulatory policies tend naturally to focus on protecting existing modes. For the last sixty years, the transportation field—beginning with the Act of 1920—has been characterized by almost total reliance on regulation by government, rather than by market forces, to insure appropriate resource allocations and to achieve desired policy goals. These assumptions are today being called into question in a wide range of fields—and transportation is no exception.

The question we must ask is not how best to regulate, but rather: Why regulate? What benefits will it achieve, and how are they to be measured? The answer, I suggest, is to be found not in rough rigid adherence to a particular economic ideology, but by analyzing the widely-varying structural characteristics of the different transportation modes. I regret that our Report often fails to make such distinctions in its analysis and recommendations.

For example, railroads are significantly different from trucking firms in capital structure, plant requirements, ownership and maintenance of rights-of-way, and labor characteristics. These differences cause wide variations in operating behavior between the two modes. Regulation of each mode must not merely take these differences into account—indeed, it must be based upon them. It is not sufficient for the Commission to express a general preference for competition. Because competition levels already vary from mode to mode, regulatory relaxation will affect each of them in a different way. The Commission should spell out how specific regulatory changes are likely to alter operational behavior.

(A) TRUCKING

Nowhere can the distinction be more clearly drawn than in the case of the trucking industry. Only 40 percent of the industry is regulated, and much of the available data indicate that the regulated share is actually declining relative to the unregulated segment. There are few industries as naturally competitive as trucking. Entry costs are unusually low, and rates could vary considerably depending on individual carriers' route structures and their operating characteristics.

The report looks for the lifting of restrictions on entry to occur sometime in the future. It suggests no reason why the policy shift should not begin now—as, indeed, it is already. There is no credible evidence that free market entry in trucking will result in any deterioration in service. Indeed, several studies indicate it may well improve. Any continued certification of motor freight carriers need only be subject to strict requirements for safety and financial fitness—both of which could be administered by an appropriate entity within the Department of Transportation.[1]

Even more important is the need to bring trucking companies within the ambit of the antitrust laws. Legalized price-fixing serves no defensible regulatory purpose, and is one of the most serious abuses of the current system. Joint rates and through routes can be established through arms-length negotiations between individual firms. There is no public policy reason for continuation of a system which fosters uniform, fixed rates to be charged by natural competitors on given routes.

(B) RAIL

Regulation of railroads serves a significantly different purpose from trucking regulation, and must be separately addressed. The primary reason for the extension of Federal controls to cover the various modes of interstate transportation in this country was to protect the traffic and revenues of railroads. While it has become increasingly clear that competition can more effectively insure reasonable rates in most transportation industries, it is not clear that the same is true for railroads. Whether the result of its long history of regulation or not, the fact is that railroading today is neither structurally nor operationally a fully competitve industry. Indeed, railroads may be said to operate more in the vein of public utilities, where economic realities dictate that only one or a handful of firms can operate efficiently in a particular market. In such situations, regulation is necessary to protect the public from unreasonably high rates. It is a necessary substitute for competitive forces absent from the marketplace.

This is not to suggest that railroad regulation cannot be improved in significant ways. Federal policy should continue to promote pricing flexibility, and should utilize the inherent competitive advantages of the various transportation modes. It must also continue, however, to protect shippers—especially those without realistic alternatives—from unreasonably high rates which may result from the absence of controls in oligopolistic market situations.

It is unlikely that the elimination of regulatory controls over railroads will foster competitive conditions which will obviate the need for some degree of continued subsidy. The problems of railroads are the result of a convergence of many economic and social factors. There is no quick cure. There are, however, a number of immediate steps which could be taken to alleviate the financial difficulties many railroads currently face. Restrictions on multi-modal ownership should be eliminated, to allow railroads the freedom to become full freight transportation companies.[2] Regarding marginal freight lines, proposals for sale or lease of trackage must also be considered, as should the possibility of public ownership of certain rail rights-of-way.[3] Federal policy should be directed more toward achieving rationalization of existing rail structures than toward wholesale lifting of regulatory controls. These would include sensible merger policies, as well as substantial restructuring of Conrail.

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[1] The Report expresses a strong bias toward regulation based on specified insurance and financial fitness factors. Aside from my substantive apprehension that unwarranted emphasis on this proposal may lead to the creation of a new test for market entry, I am also concerned that recommendations of such specificity may be inappropriate for a report of this nature. Amounts of insurance coverage or tax payments are regulations which are more sensibly delegated to an appropriate governmental board for formulation and implementation consistent with basic policies annunciated by the legislature.

[2] The railroad industry's continuing inability to generate sufficient capital to make repairs and improvements necessary to maintain a viable system is discussed in Chapter 11. Multi-modal ownership can facilitate the goal of modal integration by making the development of intermodal facilities more attractive to private transportation companies. Intermodal facilities augment the most efficient utilization of each mode towards a more effective unified system.

Rail deregulation, as a long-term policy goal, may well be warranted. It should be implemented, however, consistent with its demonstrable benefits to the public, not as an ad hoc response to the revenue problems of certain corporations, nor to the unique difficulties of Conrail.

3) DIFFERING EFFECTS OF REGULATORY REFORM

It is important that a study recommending policy changes project, to the degree possible, the anticipated impact of these policies. The Report's assessment of the impact of lessened governmental regulation on transportation industries is inhibited by the lack of consensus, as indicated above, on the policy changes that are needed. As a result, the assessments which are offered often lack real substance.

For example, I question the recommendations concerning maintenance of the common carrier obligation. These blithely assume a degree of comparability in the validity and vitality of that obligation among the various transportation modes which, in my view, simply does not exist.

Common carriage in the rail situation, characterized by unavoidable dependence on a high-volume, relatively low-cost mode in which capital and plant limitations effectively circumscribe the service that may efficiently be provided, is quite different from common carriage in the motor or water spheres. In these modes, the actual or potential presence of a number of firms—operating over rights-of-way maintained at public expense—may well provide a level of minimally assured service which renders the obligation irrelevant.

The discussion in Chapter 14 of "gainers and losers" provides another example. The analysis of the effects of rate deregulation on existing cross-subsidy patterns blurs important truck/rail distinctions. Chief among these is the assumption that cross-subsidy is present in the rate structures of both modes. Most studies indicate that cross subsidization—while evident in railroad rates for a variety of historical reasons—is largely absent from trucking. If this is so, it is most unwise to raise the specter of markedly realigned truck rates without firm evidence that cross-subsidy is present to any significant degree in the current structure.

4) USER CHARGES

The Commission's report exhibits neither clarity nor consistency in its recommendations in the area of user fees. It is not enough to assert that payments should reflect the level of usage of publicly maintained rights-of-way by particular modes. For such a recommendation to be effective, it is necessary to explain why and how they are not sufficient at present.

Understandably, there are few instances where user fee levels can fully equal total costs. However, reasonable user charges should be assessed in consideration of the taxpayers' burden and the user's direct benefit from funded services and facilities.

The most glaring deficiency in this regard is the use of public waterways by private carriers, and this should be clearly articulated in the Commission's Report. User taxes presently designed to cover operation, maintenance, and rehabilitation costs of public waterways presently cover only 16 percent of those expenses. By the year 2000, the proportion will be approximately 11 percent. These minimal percentages of payment by water freight carriers—who continue to benefit from enormous governmental outlays—do not approach a reasonable sharing of the financial burden involved in the development and maintenance of public waterways.

CONCLUDING OBSERVATIONS

For the reasons discussed above, I am less than satisfied with the product of the Commission's labors. To my mind, it fails to meet fully the policy requisites of our statutory mandate. I do want to reemphasize, however, my initial statement that the report makes many excellent contributions in areas I have not touched upon in these remarks. Indeed, even the policy sections I have criticized do reflect a strong effort to be as clear and as decisive as Commission consensus would permit.

Having stated where and how I find the report to be deficient, it remains to say why. The failings of the Report are a product not of any lack of ability or commitment on the part of Commission members or staff. Rather, they are the direct result of the Commission's structure. The mix of Congressional and private sector members, many of whom are closely identified with particular modal concerns or interests, limited what might have been accomplished. While this type of study commission has worked well in some instance—for example, in recent studies of bankruptcy and antitrust statutes—it has not proved adequate to resolve the full range of complex transportation policies which could dramatically affect powerful modal components.

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[3] Anticipated transportation changes must also be taken into account. For example, a dramatic increase in the movement of coal by 2000 is forecast. There will be a corresponding increase in the need for spur and branch lines, many of which are now being considered for abandonment. Further, the impact of additional coal traffic is likely to present outstanding safety and environmental problems.

The report devotes considerable space to the importance of recognizing the varying impact of Commission recommendations on various interests, and the necessity of developing constituencies to implement needed policy changes. It is ironic that many of these same constituencies were influential in shaping a number of particular recommendations. The Commission was unable to resolve certain policy issues because, as an institution, it mirrored the alignment of transportation interests struggling over these same issues elsewhere.

The Commission lacked the emotional freedom to chart new courses, and for two primary reasons:

1) Some Congressional members necessarily felt constrained, in certain instances, to adhere to positions they had previously taken on particular issues. They could not—nor should they be expected to—deviate too significantly from the particular interests of their constituencies. Moreover, most were reluctant to commit themselves decisively on issues on which they had not already taken positions, knowing that these would eventually come before Congress enmeshed in a multitude of other considerations which could affect their view.

2) A primary concern of most Commissioners from the private sectors was the potential impact of recommended Commission policies on their particular constituencies. Early in the Commission's deliberations, several members expressed confusion over their dual roles as advocates for particular constituencies as well as judges of the overall national interest. (See Transcript, NTPSC Meeting, Nov. 19, 1978). Clearly, expertise derived from specialized experience should inform one's judgement on overall policy issues. Indeed, that is one of the strengths of a Commission such as this. It is equally clear, however, that one cannot always know where informed judgement leaves off and sectional interest begins. I do not believe the line was drawn with any degree of finality.

These structural limitations of the Commission were evident to all who followed the progress of its work. As they largely account for the apparent confusion and inconsistency in some of the panel's recommendations, I believe they should be affirmatively recognized in this Report. In so stating, I intend no disparagement of the contributions of any Commission member, each of whom worked with considerable dedication and diligence. I simply believe that the situation rendered effective long-range policy planning impossible.

The work of the National Transportation Policy Study Commission must be viewed, I believe, as an important starting point on the road to reform. While it may not adequately chart the course ahead, it provides a useful glimpse of the ultimate destination. And unintentionally, but perhaps more importantly, it demonstrates the obstacles which must be surmounted in the course of the journey.

SENATOR HARRISON A. WILLIAMS, JR.

In the course of its study, the Commission has covered a broad array of transportation issues and contributed a great amount of forward-looking thinking to an important national debate that has long engaged the Congress, and the Country. As this debate continues, I believe the findings and conclusions contained in this final report will be an essential resource, not because of the specific conclusions and recommendations which the Commission has drawn, but because of the comprehensive nature of the Commission's research and its approach to transportation issues.

As a Member of the Senate, with a demonstrated interest in particular aspects of our national transportation policies and programs, I find myself unable to concur in all of the Commission's findings and conclusions. I have voted on specific legislation in ways that would contradict the Commission's conclusions. And there is no doubt that, as transportation issues are considered by the Congress in the future, I will vote and make decisions based upon the prevailing facts, the views and requirements of my constituents, and my own judgment.

There are several reasons why I feel compelled to qualify my support for the Commission's findings and recommendations. The first reason is one that I have been concerned about from the outset—the lack of more effective representation of consumer, labor and environmental interests on the Commission. The transportation constituency includes these groups and I believe they could have provided useful insights and balance to the Commission's discussions and decision-making. Although Chairman Shuster expressed his willingness to remedy this problem by creating formal advisory boards, the Office of Management and Budget would not approve any advisory committee charters. The Administration did not respond to my direct request for the appointment of labor representatives to serve on the Commission. As a result, the exclusion of these points of view and perspectives from direct participation diminishes the value of the final report.

The second reason for my concern is the general premise of the Commission's final report that free markets and private profits are necessarily consistent with the public interest. This is a recurring theme. As a general guidepost, reliance on market forces as an alternative to direct regulation may have great appeal. However, the Commission has not taken great care to test the general premise in specific contexts. For example, although the Commission amassed a great treasury of data, much information was not compiled objectively or applied impartially. Too often, facts on labor were provided by industry and trade associations which lacked objectivity and sometimes accuracy. In the case of environmental impacts, even where objective data generally were provided, frequently it was not adequately evaluated and mostly ignored in the Commission's recommendations. Accordingly, I cannot endorse the across-the-board reliance, implicit and explicit, of the Commission in substituting the discipline of the marketplace for some degree of regulation to achieve national transportation objectives.

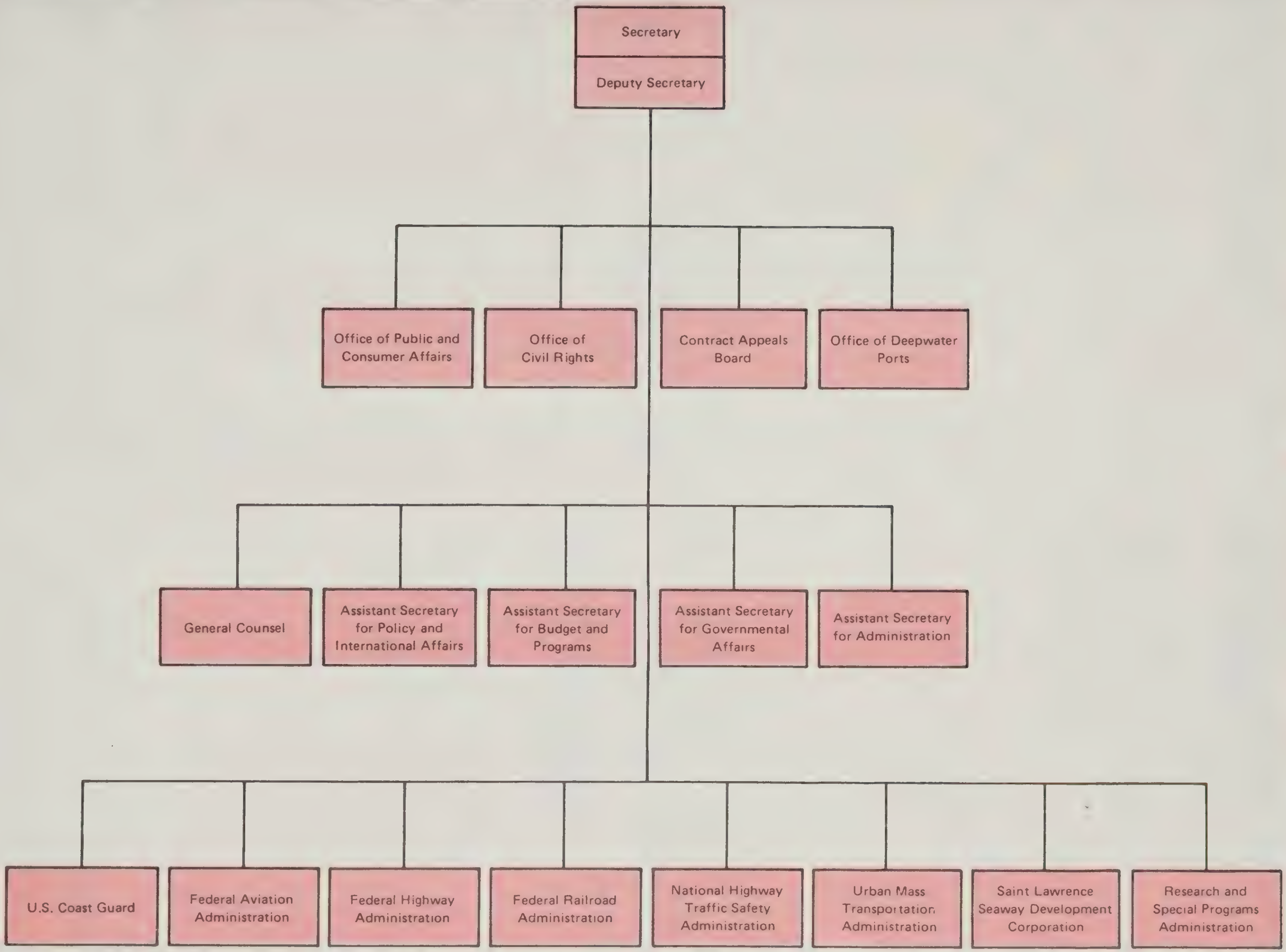
The major criticism and my principal disappointment is that the Commission failed to stress the positive role of mass transportation, particularly in light of some of its other findings. While the report fully recognizes the need to save fuel and reduce congestion, it does not adequately address our massive energy problems, and does not follow through with a recommendation that national transportation policy should encourage increased ridership and capacity in mass transit as an alternative to unnecessary automobile use.

Time and again the report stresses a "user pays" policy for most modes of transportation; but it fails to adequately discuss the potential energy and environmental benefits that efficient transit systems can have for all members of society—both users and non-users of transit. In part this is because the report places its main priorities and emphasis on economic considerations and analyses. The report seems to imply that our other national goals—social, energy, and environmental, for example—are somehow less important or less legitimate than purely transportation or economic goals. Indeed, they may be less readily quantifiable, but their effect on our social fabric and economic well-being should not be dismissed lightly, as I believe they have been.

In summary, I believe the Commission's market-oriented economics approach has been insufficiently sensitive to the value good public transit can have for this country for the balance of this century and beyond.

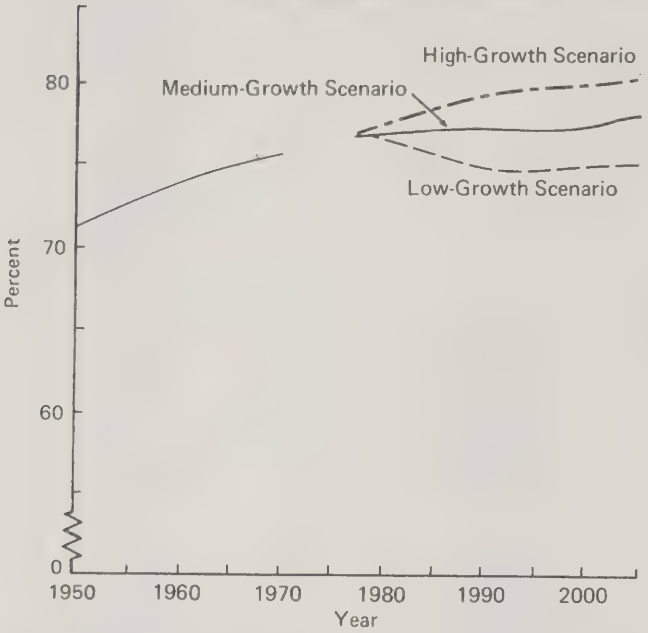
Appendix Figures and Tables

APPENDIX FIGURE 1. U.S. Department of Transportation organization chart.


Secretary
Deputy Secretary
Office of Public and Consumer Affairs
Office of Civil Rights
Contract Appeals Board
Office of Deepwater Ports
General Counsel
Assistant Secretary for Policy and International Affairs
Assistant Secretary for Budget and Programs
Assistant Secretary for Governmental Affairs
Assistant Secretary for Administration
U.S. Coast Guard
Federal Aviation Administration
Federal Highway Administration
Federal Railroad Administration
National Highway Traffic Safety Administration
Urban Mass Transportation Administration
Saint Lawrence Seaway Development Corporation
Research and Special Programs Administration

SOURCE: U.S. Government Services Administration, Office of the Federal Register, United States Government Manual 1978/79, Washington, D.C.: 1978.

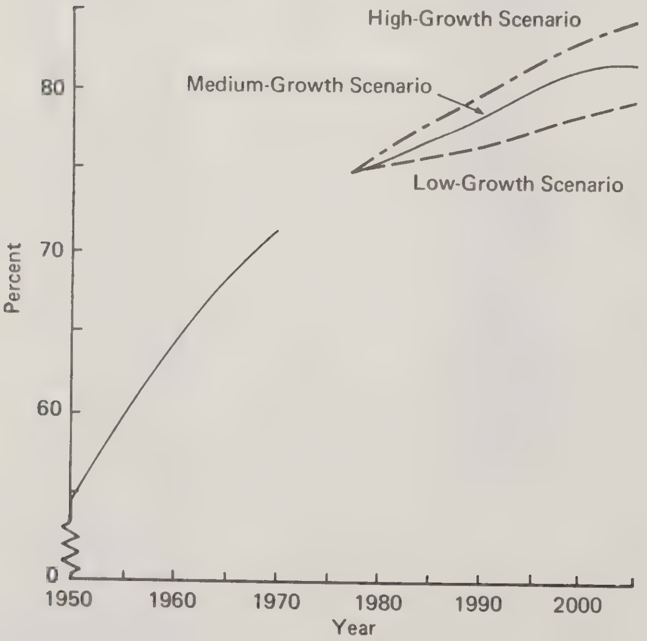
APPENDIX FIGURE 2. **U.S. population living in urban areas as a percentage of total resident population in the combined south and west census regions, 1950 to 2005.**[a]



SOURCE OF HISTORICAL DATA: U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970, Bicentennial Edition, Part 1* (Washington, D.C.: U.S. Government Printing Office, 1975) Series A172 and 178, p. 22.

[a] Using the 1970 definition of urban areas.

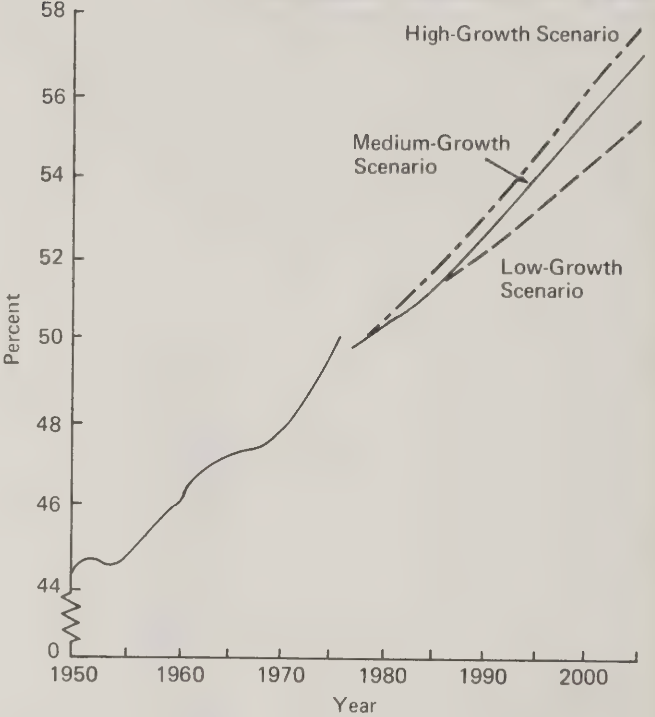
APPENDIX FIGURE 3. **U.S. population living in urban areas as a percentage of total resident population in the combined northeast and north central regions, 1950 to 2005.**[a]



SOURCE OF HISTORICAL DATA: U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970, Bicentennial Edition, Part 1* (Washington, D.C.: U.S. Government Printing Office, 1975) Series A172 and 178, p. 22.

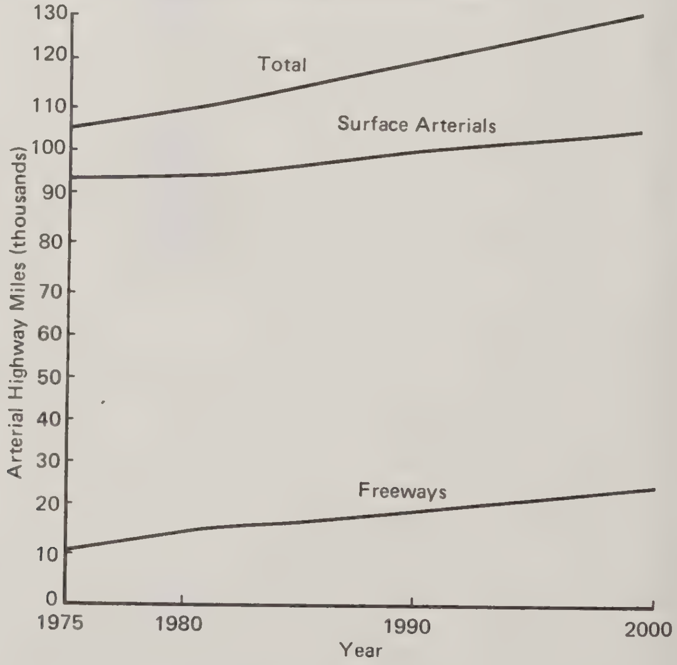
[a] Using the 1970 definition of urban areas.

APPENDIX FIGURE 4. **U.S. population in combined south and west census regions as a percentage of total resident population, 1950 to 2005.**



SOURCE OF HISTORICAL DATA: U.S. Bureau of the Census, *Current Population Reports*, Series P–25, No. 304 (April 8, 1965), No. 460 (June 7, 1970), No. 520 (July 1974), No. 615 (November 1975), and No. 646 (February 1977).

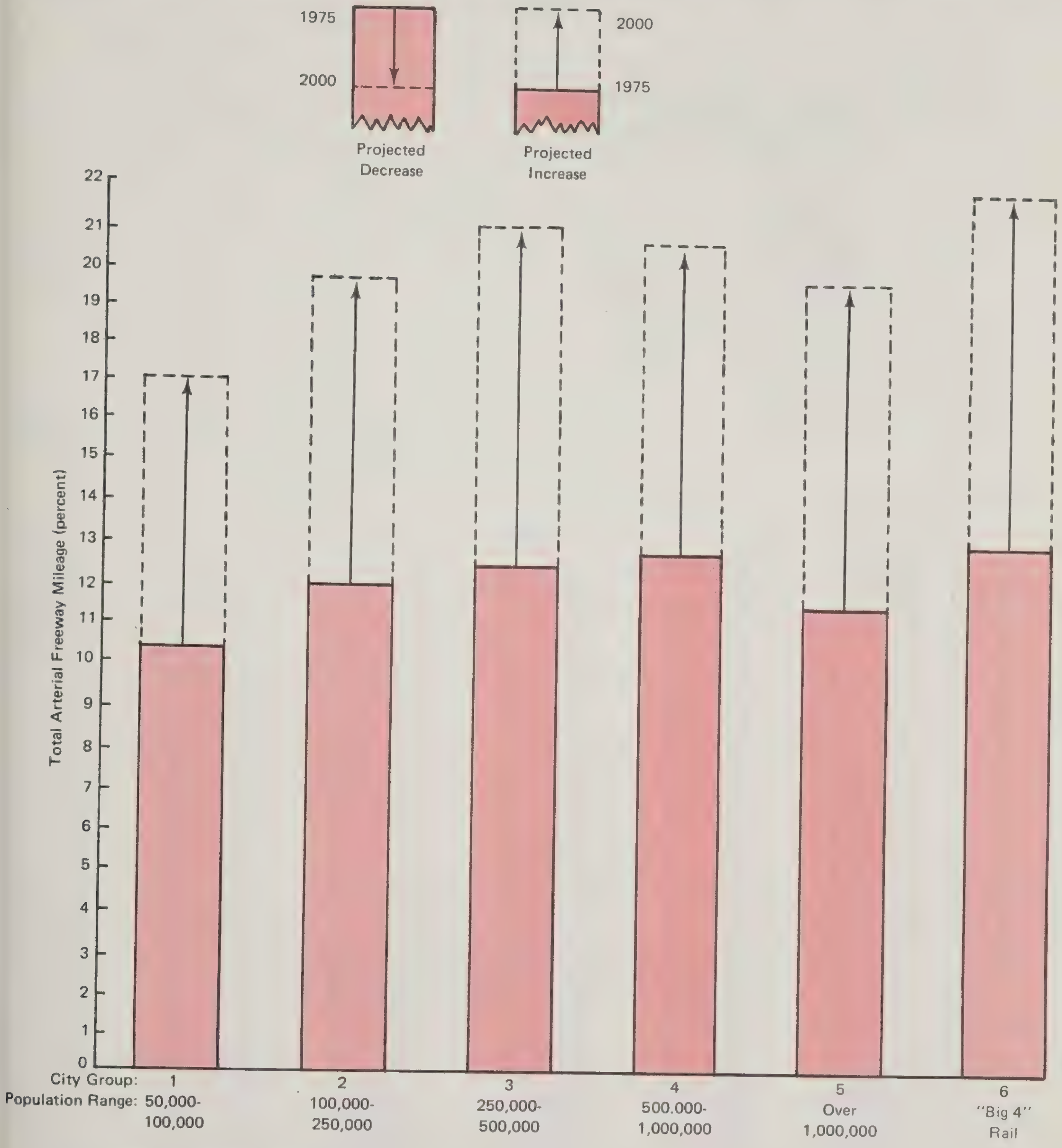
APPENDIX FIGURE 5. **Arterial highway miles.**[a]



SOURCE: Based on Appendix Table 29.

[a] From U.S. Department of Transportation, *1974 National Transportation Report, Urban Data Supplement*, Washington, D.C.: Government Printing Office, 1976. The same for all scenarios.

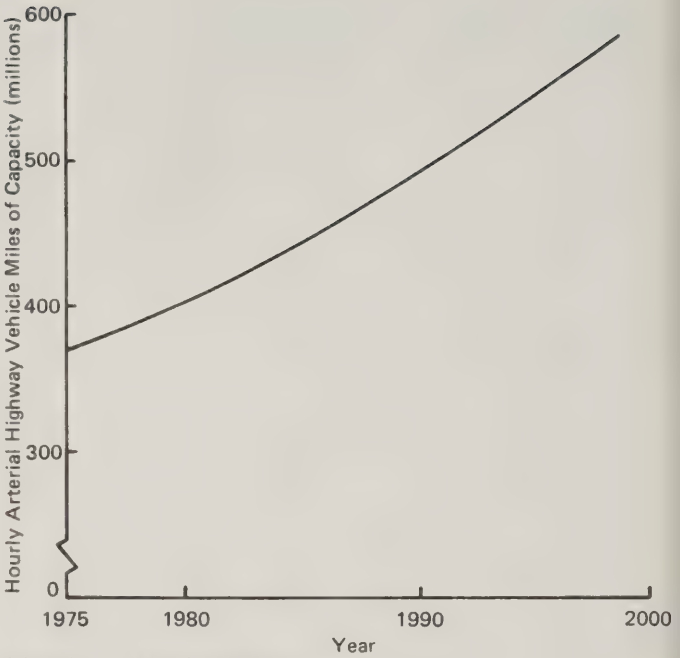
APPENDIX FIGURE 6. City group[a] comparison of 1975 and year 2000, percent of arterial mileage which is freeway.



SOURCE: Based on Appendix Table 30.

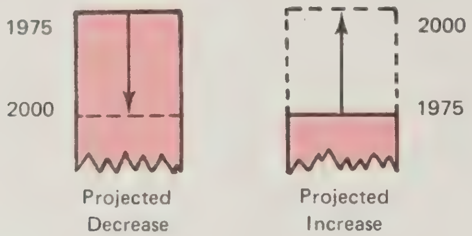
[a] City groups defined in terms of population expected in 1990.

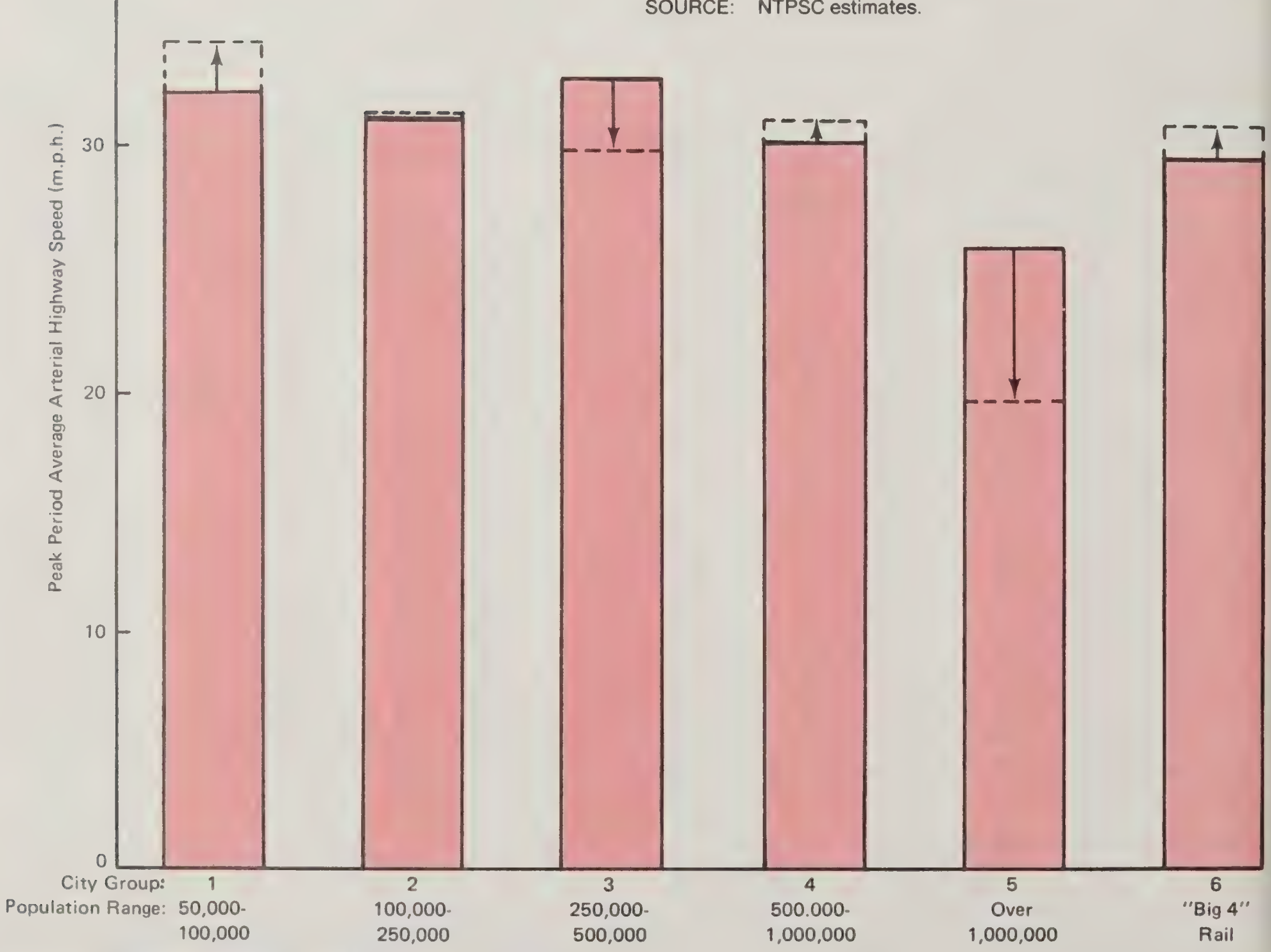
APPENDIX FIGURE 7. Urban arterial capacity miles. ►



SOURCE: NTPSC estimates.

APPENDIX FIGURE 8. City group[a] comparison of 1975 and year 2000, medium-growth scenario forecasts, peak period[b] highway speeds on urban arterials.
▼


1975
2000
Projected Decrease
2000
1975
Projected Increase

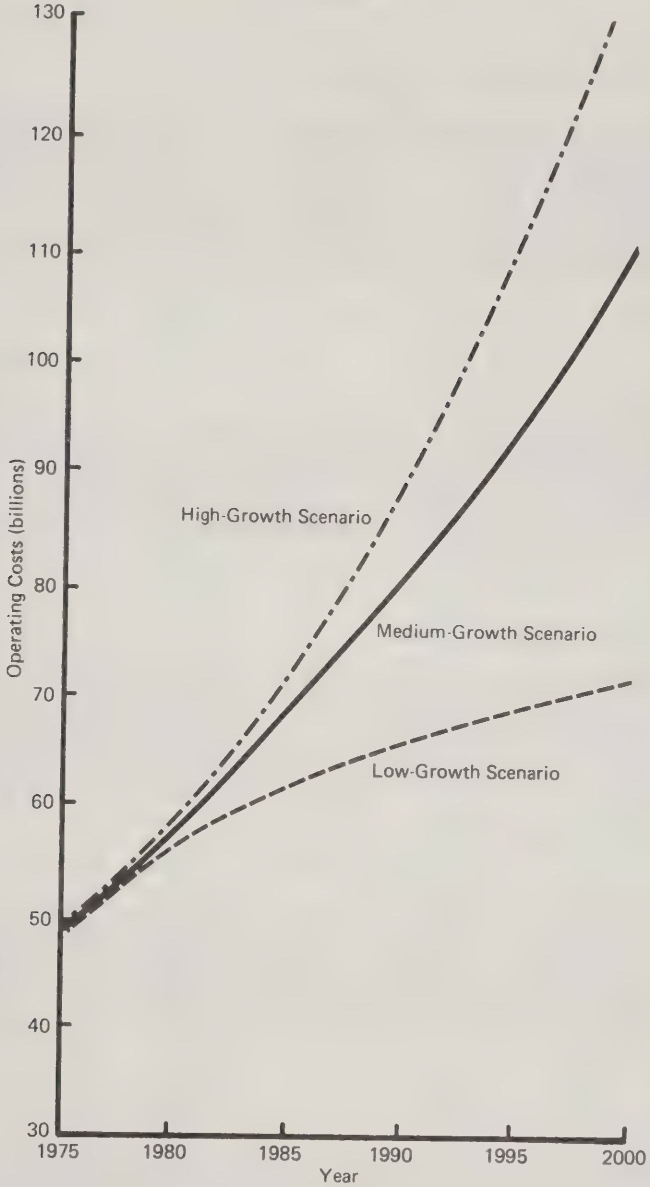


SOURCE: Based on Appendix Table 32.

[a] City groups based on expected population in 1990.

[b] Virtually identical results for all scenarios.

APPENDIX FIGURE 9. **Projections of operation costs[a] of trucks in urban goods movement, by scenario, 1975 to 2000.**



SOURCE: Based on Appendix Table 35.

[a] Medium-growth scenario based on A.T. Kearney, Inc., *Urban Goods Movement Demonstration Project Design Phase IV*, Chicago, Illinois: March 1976. Other scenarios based on adjustments according to GNP.

Appendix Tables

APPENDIX TABLE 1. Transportation union membership (1977 statistics)

Union			Total Membership	Total Transportation			Airline		
				Members	% (1)	% (2)	Members	% (3)	% (4)
American Fed. of Government Emps.	AFGE	AFL–CIO	255,000	4,350	1.7	0.2	—	—	—
Air Line Dispatchers Association	ALDA	"	Dissolved	—	—	—	—	—	—
Air Line Pilots Association	ALPA	"	49,730	24,230	[a]100.0	1.3	24,230	11.3	1.3
ALPA – Assoc. of Flight Attendants	AFA	"		16,000	[b]100.0	0.9	16,000	7.4	0.9
ALPA – Air Line Employees Assoc.	ALEA	"		9,500	[b]100.0	0.5	9,500	4.4	0.5
Amalgamated Transit Union	ATU	"	105,000	105,000	100.0	5.8	—	—	—
Int. Bro. Boilermakers & Blacksmiths	BBF	"	123,000	40,000	32.5	2.2	—	—	—
Brotherhood of Locomotive Engineers	BLE	IND.	37,600	37,600	100.0	2.0	—	—	—
Bro. of Maintenance of Way Emps.	BMWE	AFL–CIO	71,000	71,000	100.0	3.9	—	—	—
Bro. of Railway Carmen of America	BRCA	"	56,000	56,000	100.0	3.1	—	—	—
Bro. Railway & Airline Clerks	BRAC	"	160,000	158,500	99.9	8.8	7,500	3.5	0.4
Bro. of Railroad Signalmen	BRS	"	10,000	10,000	100.0	0.5	—	—	—
Communications Workers' of America	CWA	"	476,000	500	0.1	0.0	500	0.2	0.0
Flight Engineers' Intl. Assoc.	FEIA	"	1,800	1,800	100.0	0.1	1,800	0.8	0.1
Great Lakes Licensed Officers Assoc.	GLLO	IND.	60	60	100.0	0.0	—	—	—
Hotel & Rest. & Bartenders Int'l. Union	H&RE&B	AFL–CIA	421,000	1,000	0.2	0.0	500	0.2	0.0
Int'l. Assoc. Machinists & Aerospace	IAM	"	757,564	105,000	4.0	5.8	80,000	37.2	4.4
Int'l Bro. Electrical Workers	IBEW	"	856,000	20,000	2.0	1.1	—	—	—
Int'l. Bro. Firemen & Oilers	IBFIO	"	40,000	40,000	100.0	2.2	—	—	—
Int'l Bro. of Teamsters	IBT	IND.	2,300,000	638,500	27.8	35.3	5,000	2.3	0.3
Int'l Longshoremens Assoc.	ILA	AFL–CIO	66,900	60,000		3.3	—	—	—
ILA – Masters, Mates & Pilots	MMP	"		6,900	[c]100.0	0.4	—	—	—
Int'l. Longshoremen & Warehousemens	ILWU	IND.	58,000	11,000	19.0	0.6	—	—	—
Indust. Un. Marine & Shipbuilding	IUMSW	AFL–CIO	22,000	22,000	100.0	1.2	—	—	—
Marine Engineers Beneficial Assoc.	MEBA	"	24,500	9,500	[d]	0.5	—	—	—
MEBA – Prof. Air Traffic Controllers	PATCO	"		15,000	[e]	0.8	15,000	7.0	0.8
Nat'l. Maritime Union of America	NMU	"	35,000	35,000	100.0	1.9	—	—	—
Ameri Railway & Airline Supervisors	ARSA	"	6,540	6,540	100.0	0.4	40	0.0	0.0
Railroad Yardmasters of America	RYA	"	4,000	4,000	100.0	0.2	—	—	—
Bro. Sleeping Car Porters	BSCP	"	1,000	1,000	100.0	0.0	—	—	—
Service Employees Int'l Union	SEIU	"	480,000	775	0.3	0.0	—	—	—
Seafarers' Int'l Un. of No. Amer.	SIU	"	80,000	32,200	40.2	4.4	—	—	—
Sheet Metal Workers Int'l. Assoc.	SMWIA	"	120,000	6,000	5.0	0.3	—	—	—
American Train Dispatchers Assoc.	ATDA	"	3,000	3,000	100.0	0.2	—	—	—
Transport Workers' Union of Amer.	TWU	"	118,000	118,000	100.0	6.5	55,000	25.6	3.0
United Transportation Union	UTU	"	134,000	134,000	100.0	7.4	—	—	—
Office & Professional Emps. Intl.	OPEIU	"	74,000	300	0.4	0.0	—	—	—
Total	—	—	6,946,694	1,804,255	—	*101.8	215,070	*99.9	11.7

Percentages:
1. Percentage of total union's individual membership
2. Percentage of total transportation union membership
3. Percentage of total modal union membership
4. Percentage of total transportation union membership

[a] Pilots only

[b] Subsidiary of ALPA

[c] Affiliate of ILA

[d] See PATCO membership below

[e] An Affiliate of MEBA, above

*Due to rounding

Source: D.C. Associates, Inc., "A Report to the National Transportation Policy Study Commission on Identification of Labor Constituencies," Washington, D.C.: 1977, Section 3.0.

Intercity Bus/Auto			Maritime			Railroad			Intracity Transit Bus/Taxi			Truck Intra & Intercity		
Members	% (3)	% (4)	Members	% (3)	% (4)	Members	% (3)	% (4)	Members	% (3)	% (4)	Members	% (3)	% (4)
—	—	—	4,000	1.6	0.2	350	0.1	0.0	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
80,000	99.6	—	—	—	—	—	—	—	25,000	27.6	1.4	—	—	—
—	—	—	35,000	14.1	1.9	5,000	0.9	0.3	—	—	—	—	—	—
—	—	—	—	—	—	37,600	6.9	2.0	—	—	—	—	—	—
—	—	—	—	—	—	71,000	13.0	3.9	—	—	—	—	—	—
—	—	—	—	—	—	56,000	10.3	3.1	—	—	—	—	—	—
200	0.3	0.0	—	—	—	149,000	27.3	8.3	1,000	1.1	0.0	800	0.1	0.0
—	—	—	—	—	—	10,000	1.8	0.5	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	60	0.0	0.0	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	500	0.1	0.0	—	—	—	—	—	—
—	—	—	—	—	—	25,000	4.6	1.4	—	—	—	—	—	—
—	—	—	—	—	—	20,000	3.7	1.1	—	—	—	—	—	—
—	—	—	28,000	11.3	1.5	12,000	2.2	0.7	—	—	—	—	—	—
—	—	—	5,000	2.0	0.3	1,500	0.3	0.1	5,000	5.5	0.3	622,000	99.9	34.3
—	—	—	60,000	24.2	3.3	—	—	—	—	—	—	—	—	—
—	—	—	6,900	2.8	0.4	100	0.0	0.0	—	—	—	—	—	—
—	—	—	11,000	4.4	0.6	—	—	—	—	—	—	—	—	—
—	—	—	22,000	8.9	1.2	—	—	—	—	—	—	—	—	—
—	—	—	9,000	3.6	0.5	100	0.0	0.0	—	—	—	—	—	—
—	—	—	—	—	1.9	—	—	—	—	—	—	—	—	—
—	—	—	35,000	14.1	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	6,500	1.2	0.4	—	—	—	—	—	—
—	—	—	—	—	—	4,000	0.7	0.2	—	—	—	—	—	—
—	—	—	—	—	—	1,000	0.2	0.0	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	775	0.9	0.0	—	—	—
—	—	—	32,000	12.9	1.8	200	0.0	0.0	—	—	—	—	—	—
—	—	—	—	—	—	6,000	1.1	0.3	—	—	—	—	—	—
—	—	—	—	—	—	3,000	0.5	0.2	—	—	—	—	—	—
—	—	—	—	—	—	13,000	2.4	0.7	50,000	55.3	2.8	—	—	—
100	0.1	—	—	—	—	125,500	23.0	7.0	8,400	9.3	0.5	—	—	—
—	—	—	—	—	—	—	—	—	300	0.3	0.0	—	—	—
80,300	100	4.4	247,960	99.9*	13.6	546,600	100.3*	30.2	90,475	100	5.0	622,800	100	34.3

APPENDIX TABLE 2. Class I and class II federally regulated motor carriers by commodity class and type of carriage[a]

Commodity Class	No. of Carriers	Type of Carriage	(000)[b] Tons 1977	Miles 1977
All	1,962	Total	705,867	16,047,222
		Common	650,157	14,966,176
		Contract	55,711	1,081,046
General Freight	732	Total	231,194	7,434,353
		Common	227,367	7,344,280
		Contract	3,828	90,073
Household Goods	103	Total	2,890	606,954
		Common	2,889	606,908
		Contract	0	46
Heavy Machinery	56	Total	10,376	431,740
		Common	10,212	429,960
		Contract	164	1,781
Liquid Petroleum	142	Total	182,118	1,335,571
		Common	177,500	1,308,187
		Contract	4,618	27,383
Refrigerated Products	102	Total	21,189	1,113,727
		Common	19,116	1,011,404
		Contract	2,073	102,322
Agricultural Commodities	71	Total	12,884	339,542
		Common	9,614	294,535
		Contract	3,269	45,006
Motor Vehicles	37	Total	27,091	843,068
		Common	19,985	589,283
		Contract	7,106	253,786
Building Materials	91	Total	32,742	513,513
		Common	27,218	442,213
		Contract	5,524	71,299
All Other Commodities	628	Total	185,383	3,428,754
		Common	156,255	2,939,406
		Contract	29,128	489,348

SOURCE: American Trucking Association, *Motor Carrier Statistical Summary,* Washington, D.C. 1977.

[a] Excludes carriers whose reports were incorrect or incomplete; properly reported data represents 80 to 90 percent of federally-regulated tonnage carried. Class I refers to motor carriers whose annual revenues exceed $3,000,000. Class II motor carriers' annual revenues are $500,000 to $3,000,000.

[b] Figures may not add due to rounding.

APPENDIX TABLE 3. Intercity passenger-miles by common carriers (billions of passenger-miles)

	Air		Bus		Rail[a]		Total	
Year	Amount	%[b]	Amount	%[b]	Amount	%[b]	Amount	%
1939	.8	.3	9.5	3.1	23.7	7.7	34.0	11.0
1940	1.2	.4	10.2	3.1	24.8	7.5	36.2	11.0
1941	1.7	.5	13.5	3.6	30.6	8.3	45.8	12.4
1942	1.7	.5	21.3	6.6	55.1	17.1	78.1	24.2
1943	2.0	.7	25.9	8.8	89.9	30.6	117.8	40.1
1944	2.9	.9	27.3	8.8	97.7	31.6	127.9	41.4
1945	4.3	1.2	27.4	7.9	93.5	27.1	125.6	36.2
1946	7.2	1.7	26.9	6.3	66.3	15.6	100.4	23.6
1947	7.1	1.7	24.8	5.8	46.8	11.0	78.7	18.4
1948	6.8	1.5	24.6	5.6	41.9	9.5	73.3	16.7
1949	7.8	1.6	24.0	5.0	36.0	7.5	67.8	14.2
1950	9.3	1.8	22.7	4.5	32.5	6.5	64.5	12.8
1951	12.0	2.1	23.6	4.1	35.3	6.2	70.9	12.4
1952	13.3	2.2	24.7	4.0	34.7	5.7	72.7	11.9
1953	16.2	2.5	24.4	3.8	32.3	5.0	72.9	11.2
1954	18.2	2.7	22.0	3.3	29.5	4.4	69.7	10.4
1955	21.3	3.0	21.9	3.1	28.7	4.0	71.9	10.1
1956	23.9	3.2	21.7	2.9	28.6	3.8	74.2	10.0
1957	26.3	3.5	21.5	2.9	26.3	3.5	74.1	9.9
1958	26.4	3.5	20.8	2.7	23.6	3.1	70.8	9.3
1959	30.5	4.0	20.4	2.7	22.4	2.9	73.3	9.6
1960	31.7	4.1	19.3	2.5	21.6	2.8	72.6	9.3
1961	32.3	4.1	20.3	2.6	20.5	2.6	73.1	9.3
1962	34.8	4.3	21.8	2.7	20.2	2.5	76.8	9.4
1963	39.4	4.6	22.5	2.6	18.6	2.2	80.5	9.5
1964	45.5	5.1	23.3	2.6	18.4	2.1	87.2	9.8
1965	53.9	5.9	23.8	2.6	17.6	1.9	95.1	10.4
1966	63.7	6.6	24.6	2.5	17.3	1.8	105.6	10.9
1967	80.2	7.9	24.9	2.4	15.3	1.5	120.4	11.8
1968	93.0	8.6	24.5	2.3	13.3	1.2	130.8	12.2
1969	111.1	9.8	24.9	2.2	12.3	1.1	148.3	13.1
1970	109.5	9.3	25.3	2.1	10.9	.9	145.7	12.3
1971	110.7	9.0	25.5	2.1	8.9	.7	145.1	11.8
1972	123.0	9.5	25.6	1.9	8.7	.7	157.3	12.1
1973	132.4	9.8	26.4	2.0	9.3	.7	168.1	12.5
1974	135.4	10.7	27.7	2.2	10.4	.8	173.5	13.8
1975	136.9	10.5	25.4	1.9	10.1	.8	172.4	13.2
1976	152.3	11.0	25.1	1.8	10.4	.8	187.8	13.5
1977	164.2	11.3	25.9	1.8	10.4	.7	200.5	13.9
1978	191.6	12.5	25.1	1.6	10.3	.7	227.0	14.8

SOURCE: Transportation Association of America, *Transportation Facts and Trends 1978,* Washington, D.C.: 1978, p. 18.

[a] includes commutation.

[b] percentage of total intercity passenger-miles.

APPENDIX TABLE 4. Selected statistics on trip purpose and travel mode

Part A

Trip Purpose	Percent Distribution of Person-Trips All Modes 1977	Percent Distribution of Person-Trips All Modes 1972
Visit Friends & Relatives	37.0	38.4
Other Pleasure	26.0	25.7
Business	19.5	20.2
Other	17.5	15.7
	100.	100.

Part B

Trip Purpose	Travel Mode (Percent of Household Trips) Bus	Auto (1)[a]	Auto (2)[b]	Train	Air	Total
Visit Friends & Relatives	23.6	35.7	18.7	36.1	22.0	32.2
Other Pleasure	41.3	22.5	69.6	12.5	12.9	23.3
Business	8.5	23.7	6.9	39.4	54.8	27.7
Other	26.6	18.1	10.8	12.0	10.3	16.8
						100.

SOURCE: U.S. Census of Transportation, 1977.

[a] Auto 1 = Auto or Truck.

[b] Auto 2 = Auto or Truck with camping equipment.

APPENDIX TABLE 5. Principal commodities transported, by mode, various years

Commodity	Share of Tons	Share of Revenue
Principal Commodities Transported on Inland Waterways, 1977 (Excludes Great Lakes)		
1. Bitum Coal & Lignite	21%	
2. Residual Fuel Oil	13%	
3. Sand, Gravel, & Crushed Rock	9%	
4. Crude Oil	9%	
5. Grain, Grain Products & Soy	8%	
6. Distillate Fuel Oil	7%	
7. Gasoline	6%	
8. Rafted Logs	3%	
9. Basic Chemicals	2%	
10. Marine Shells	2%	
	81%	
Principal Commodities Transported on Class I Railroads, 1977		
1. Coal	30%	14%
2. Non-Metallic Minerals	10%	4%
3. Farm Products	9%	8%
4. Chemicals & Allied Products	7%	11%
5. Lumber & Wood Products	7%	7%
6. Food & Kindred Products	7%	11%
7. Metallic Ores	6%	2%
8. Stone, Clay, & Glass Products	4%	4%
9. Primary Metal Products	4%	5%
10. Coal & Petroleum Products	3%	4%
	87%	70%
Principal Commodities Transported by Motor Carrier, 1973 (ICC Regulated)		
1. Coal & Petroleum Products	27%	4%
2. Chemicals & Allied Products	12%	7%
3. Food & Kindred Products	9%	7%
4. Transportation Equipment	9%	7%
5. Primary Metal Products	8%	4%
6. Stone, Clay & Glass Products	6%	2%
7. Farm Products	3%	2%
8. Non Metallic Minerals, except Fuels	2%	−%
9. Fabricated Metal Products	2%	2%
10. Machinery except electrical	2%	3%
	80%	38%
Principal Commodities Transported by Motor Carriers, 1972 (Non-ICC Regulated)		
1. General Freight		22%
2. Sand & Gravel		17%
3. Agricultural & Exempt Commodities		16%
4. Trash & Garbage Collection		13%
5. Household Goods		10%
6. Mail, Contract		3%
7. Timber		3%
8. Package & Parcel Delivery		2%
		86%
Principal Commodities Carried in U.S. Great Lakes Waterborne Commerce, 1976		
1. Iron Ore & Concentrates	49%	
2. Limestone	20%	
3. Coal & Lignite	16%	
4. Sand, Gravel & Crushed Stone	3%	
5. Building Cement	2%	
6. Distillate Fuel Oil	1%	
7. Gasoline	1%	
8. Residual Fuel Oil	2%	
9. Non-Metallic Minerals	1%	
10. Wheat	1%	
	96%	

SOURCES: U.S. Army Corps of Engineers, *Waterborne Commerce Statistical Data;* ICC, *Freight Commodity Statistics;* and U.S. Department of Commerce, Office of Domestic Shipping, *Domestic Waterborne Trade of the United States, 1972–1976*, p. 51.

APPENDIX TABLE 6. Tourist arrivals, by transport mode, 1977

Source	Tourist Arrivals (no. of persons)	Air	Land	Water
		(percentage distribution)		
Canada	12,083,386	20	77	2
Mexico	2,029,745	18	81	—
Total Overseas	4,496,663	93	5	2
Total Arrivals	18,609,794	38	60	2

SOURCE: Summary and Analysis of International Travel to the U.S., U.S.T.S., Department of Commerce.

APPENDIX TABLE 7. Charter travelers, by citizenship and use of U.S.- or foreign-flag carrier, 1977

Citizenship	U.S.-Flag	Foreign-Flag	Total
	(millions of travelers)		
U.S. Citizen	1.4	0.5	1.9
Non U.S. Citizen	0.3	0.3	0.6
All	1.7	0.8	2.5

SOURCE: U.S. International Air Travel Statistics, U.S. Department of Transportation, 1977.

APPENDIX TABLE 8. Scheduled travelers, by citizenship and use of U.S.- or foreign-flag carrier, 1977

Citizenship	U.S.-Flag	Foreign-Flag	Total
	(millions of travelers)		
U.S. Citizen	3.5	2.9	6.4
Non U.S. Citizen	2.4	3.5	5.9
All	5.9	6.4	12.3

SOURCE: U.S. International Air Travel Statistics, U.S. Department of Transportation, 1977.

APPENDIX TABLE 9. Air cargo by volume by world markets, 1977[a]

	Imports				Exports			
	Weight (Millions of lbs.)		Value (Millions of $)		Weight (Millions of lbs.)		Value (Millions of $)	
Continent	All	U.S.	All	U.S.	All	U.S.	All	U.S.
North America	180	70	894	364	388	146	2,104	993
South America	127	32	556	183	273	95	1,640	505
Europe	541	196	5,710	2,114	689	193	9,554	2,569
Asia	445	228	4,853	2,231	338	117	5,135	1,675
Australia	11	5	81	34	40	15	568	234
Africa	6	1	477	28	54	14	659	212
All	1,311	532	12,573	4,955	1,796	585	20,253	6,532

SOURCE: U.S. Airborne Foreign Trade Exports and General Imports; U.S. Bureau of Census, Annual 1977, FT986, May 1978.

[a] Totals may not add due to rounding.

APPENDIX TABLE 10. NTPSC population assumptions.[a]

Assumption	Scenario		
	Low-Growth	Medium-Growth	High-Growth
Fertility Rate[b]	Bureau of Census Series III:[c] fertility rate = 1,700	Bureau of Census Series II:[c] fertility rate = 2,100	Bureau of Census Series III:[c] fertility rate = 1,700
Immigration	Immigration remains constant at 400,000 persons per year		
Life Expectancy	Gradual increase in life expectancies: for males, from 69.1 in 1976 to 70.1 years in 2005 and for females, from 77 years in 1976 to 78.5 years in 2005[d]		
Birth Rate	Declining birth rate	Constant birth rate	Declining birth rate
Median Age	Increasing median age from 29 in 1976 to 39 in 2005[e]	Increasing median age from 29 in 1976 to 36.3 in 2005[e]	Increasing median age from 29 in 1976 to 39 in 2005[e]
Dependency Ratio	Decline in dependency ratio		
Transportation Implications	Population changes will have small near-term effects on transportation activity. Potential 1990 drivers have already been born, and the relationship of freight movement to total population growth is unclear. Yet with population age redistribution, there will be a major increase in high-travel-propensity age groups. A decline in the number of young drivers is expected to improve safety.		

[a] These assumptions cover the total U.S. population, including armed forces abroad, and were used to forecast to the year 2000 from a 1975 base.

[b] Fertility rates are expressed as the average number of lifetime births per thousand women. The replacement level is believed to be 2100.

[c] The Bureau of the Census developed three projections of the fertility rate with Series I and III representing the high and low estimates, respectively, and Series II being regarded as the most likely estimate. For further discussion, see: George Sternlieb and James Hughes, *Current Population Trends in the United States,* New Brunswick, New Jersey: The Center for Urban Policy Research, pp. 14–15, 80.

[d] Bureau of the Census, *Statistical Abstract of the United States 1978,* Washington, D.C.: Government Printing Office, 1978, p. 69.

[e] Bureau of the Census, *Population Estimates and Projections,* Series P–25, No. 541, Washington, D.C.: Government Printing Office, February 1975, p. 8.

APPENDIX TABLE 11. NTPSC urban population distribution assumptions, trends and implications—south and west central regions

	Scenario		
	Low-Growth	Medium-Growth	High-Growth
Assumptions	Smaller rural flows to urban centers: 0.2% through 2000, compared to 1.7% from 1950–60 & 0.9% from 1960–70,[a] due to retention of rural workers.	Smaller rural flows to urban centers: about 0.3% through 2000.	Larger rural flows to urban centers: about 0.5% through 2000.
Trends	Absolute & relative growth in rural & small urban population (much greater than in the North & East).	Absolute & relative growth in rural & small urban population.	Absolute & relative growth in urban population.
	Declining central city populations.		
	Suburbanization of jobs.		
	Continued suburbanization on Standard Metropolitan Statistical Area fringes.		
Transportation Implications	Increased trip lengths, with potential for decline according to pattern of employment suburbanization.		
	Increase in auto efficiency potential and decrease in transit potential, with arterial highway expansion.		
	Readjustment of rural and urban freight flow patterns.		

[a] Source of 1950–1970 data is Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970, Bicentennial Edition, Part I,* Washington, D.C.: Government Printing Office, 1975, Series A172 and 178, p. 22.

APPENDIX TABLE 12. NTPSC urban population distribution assumptions, trends and implications—northeast and north central regions

<table>
<tr><th rowspan="2"></th><th colspan="3">Scenario</th></tr>
<tr><th>Low-Growth</th><th>Medium-Growth</th><th>High-Growth</th></tr>
<tr><td>Assumptions</td><td>Restrained rural flows to urban centers: 0.05% annually through 2000, compared to 0.4% from 1950–1960 & 0.2% from 1960–1970[a] due to lagging economic growth & depressed urban conditions.</td><td>Smaller rural flows to urban centers: about 0.05% through 2000, because of some success in rehabilitating urban centers.</td><td>Increased rural flows to urban centers: about 0.25% through 2000, comparable to historical experience.</td></tr>
<tr><td rowspan="4">Trends</td><td>Absolute and relative growth in rural & small urban population (though much less than in South & West).</td><td>Absolute and relative growth in rural and small urban population.</td><td>Continued urban growth, albeit at slower rates of growth.</td></tr>
<tr><td colspan="3">Declining central city populations.</td></tr>
<tr><td colspan="3">Suburbanization of jobs.</td></tr>
<tr><td colspan="3">Continued suburbanization of Standard Metropolitan Statistical Area fringes.</td></tr>
<tr><td rowspan="3">Transportation Implications</td><td colspan="3">Increased trip lengths, but potential for decline according to the pattern of employment suburbanization.</td></tr>
<tr><td colspan="3">Increase in auto efficiency potential and decrease in transit potential.</td></tr>
<tr><td colspan="3">Readjustment of rural and urban freight-flow patterns.</td></tr>
</table>

[a] Source of 1950–1970 data is Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970, Bicentennial Edition, Part I*, Washington, D.C.: Government Printing Office, 1975, Series A172 and 178, p. 22.

APPENDIX TABLE 13. U.S. population redistribution assumptions, trends and implications, by scenario

<table>
<tr><th rowspan="2"></th><th colspan="3">Scenario</th></tr>
<tr><th>Low-Growth</th><th>Medium-Growth</th><th>High-Growth</th></tr>
<tr><td>Assumptions</td><td>Smallest population shifts to the South & West, with lagging economic growth discouraging geographic dispersion: about 4% per annum, comparable to the 1950–1970 period.[a]</td><td>Median population shifts (albeit largest numerical increase in the regional population totals due to largest national population total): about 5% annually.</td><td>Largest population shifts to South & West, with increased resource production stimulating rapid economic development: about 6% annually, compared to 8% in the 1970–1976 period.[a]</td></tr>
<tr><td rowspan="2">Trends</td><td colspan="3">Interregional migration flows out of the East and Midwest, to the South and West.</td></tr>
<tr><td colspan="3">Employment shifts parallel population shifts.</td></tr>
<tr><td rowspan="5">Transportation Implications</td><td colspan="3">Readjustment of intercity freight flow patterns, particularly of consumer goods and travel patterns in proportion to the scale of population and employment shifts.</td></tr>
<tr><td colspan="3">Population change will tax the facilities left behind as well as those in the growth areas.</td></tr>
<tr><td colspan="3">Decline of transport access a major factor in determining industrial location.</td></tr>
<tr><td colspan="3">Changes in intercity business travel patterns.</td></tr>
<tr><td colspan="3">Requires building of passenger and freight transportation infrastructure in growth areas not presently served by adequate facilities.</td></tr>
</table>

[a] George Sternlieb and James Hughes, *Current Population Trends in the United States*, New Brunswick, New Jersey: The Center for Urban Policy Research, 1978, Exhibit 33, p. 65.

APPENDIX TABLE 14. U.S. disposable personal income per capita assumptions, trends and implications, by scenario

	Scenario		
	Low-Growth	Medium-Growth	High-Growth
Assumptions	Based on regression relationship to low GNP growth, with an annual growth rate of less than 1%, compared to an historic rate of about 2.5% since 1950.[a]	Based on regression relationship to moderate GNP growth, with an annual growth rate comparable to historic experience at about 2.5% annually.[a]	Based on regression relationship to high GNP growth, with an annual growth rate of more than 4%.
Trends	Low growth in disposable income per individual will decline with real earned income per capita, as economic growth fails to keep up with population growth.	Disposable income per individual grows comparably to historical experience and slightly faster than real earned income.	Disposable income per individual grows slightly faster than real earned income, with government taxation of earnings held steady.

[a] Source of historic rate is Bureau of Economic Analysis, *Business Statistics*, 1975, Washington, D.C.: Government Printing Office, May 1976, p. 8; *Survey of Current Business*, Vol. 57, No. 8, August 1977, p. S–1.

APPENDIX TABLE 15. U.S. investment assumptions, trends and implications, by scenario

	Scenario		
	Low-Growth	Medium-Growth	High-Growth
Assumptions	Low annual rate of growth in business investment, averaging 1.5% comparable to the low achieved during the 1970–76 period[a] due to low expectations of a substantial return.	Moderate annual rate of growth in business investment, averaging 3.6%, comparable to the overall historical experience since 1950.[a]	High annual rate of growth in business investment, averaging 5.2%, comparable to the high achieved during the 1960–1970 period,[a] with increased pressures for growth and development.
Trends	Focuses on the long-term trend averaged over the 28-year period, rather than cyclical fluctuations.		
	A low rate of business investment will impede productivity growth, restrict employment, and jeopardize U.S. competitiveness in world markets.	A steady rate of business investment will stabilize technological development, and labor productivity and employment growth, at least in the short-term.	A high rate of business investment will enhance technological development and labor productivity growth, provide employment and maintain U.S. competitiveness in world markets.
Transportation Implications	Less capital available for building new transportation infrastructure.	Sufficient available capital for building new transportation infrastructure.	Much capital available for building new transportation infrastructure.
	Incentive to repair and rehabilitate old facilities before building new ones with scarcity of new capital.	Slight incentives to favor new transportation facilities and equipment with requirements for pollution control devices and techniques.	Incentive to build new transportation facilities and retire old ones with establishment of accelerated depreciation allowances.
	Difficulty of expanding transportation supply expected to induce deterioration and congestion of present facilities and possibly to restrict transportation demand.	Allegiance to more efficient resource allocation and conservation policies, supported by controlled investment, expected to decrease auto efficiency potential and increase transit potential.	Ample availability of capital expected to induce increased R&D into new transportation modes and equipment, operating procedures, etc.
			Ease of expanding transportation supply expected to induce increased transportation demand.
	Selective business and government investment may favor one or more of the modes, for either passenger or freight.		

[a] Council of Economic Advisors, *The Economic Report of the President*, January 1977, Table B–2, p. 188.

APPENDIX TABLE 16. Environmental regulations affecting transportation

Market	Mode	Media: Environmental Regulation	Regulatory Agency	Federal Law	Common Name
Urban (Passenger, Freight)	Highway	Air Pollution: Mobile source controls, i.e., emission standards for light-duty vehicles (autos), heavy-duty vehicles (trucks, buses) and diesel vehicles (cars, buses, trucks); traffic control on both light- and heavy-duty vehicles (autos, trucks, buses)	EPA	P.L. 95–95	CAAA '77
		Noise Pollution: Mobile source controls (emission standards for trucks, buses, motorcycles); traffic controls (rerouting curfews)	EPA/DOT	P.L. 92–574	NCA '72
		Land Use: Construction of urban highways (e.g., N.Y.'s Westway; Washington, D.C.'s Rt. 66)	EPA/CEQ	P.L. 91–190	NEPA '69
	Rail	Noise Pollution: Source controls	FRA/EPA	P.L. 92–574	NCA '72
		Air Pollution: Fugitive air emissions at transhipment points	EPA	P.L. 95–95	CAAA '77
		General/Safety: Hazardous materials transport	DOT/EPA	P.L. 94–580	RCRA '76
	Waterway	Water Pollution: Port development (e.g., LOOP system), dredge & fill requirements	ACE	P.L. 95–217	CWA '77
		Air Pollution: Fugitive emissions at transhipment points	EPA	P.L. 95–95	CAAA '77
	Pipeline	Land Use: Sewer line construction	EPA/CEQ	P.L. 91–190	NEPA '69
	Aviation	Noise Pollution: Airport and aircraft abatement (barrier construction, purchase of easements, retrofit)	FAA EPA	P.L. 92–574 P.L. 94–301	NCA '72 AADAA '76
	General	Air Pollution: Air resource plans; i.e., impact of non-attainment policy on growth and transportation demand	EPA	P.L. 95–95	CAAA '77
Rural (Passenger, Freight)	Highway	Land Use: EIS requirements, i.e., construction impacts on wetlands and critical habitats. EIS externalities and more advance/ comprehensive/cumulative planning by state and Federal transport agencies	EPA/CEQ	P.L. 91–190	NEPA '69
	Rail	Air Pollution: Fugitive emissions at transhipment points	EPA	P.L. 95–95	CAAA '77
		Noise Pollution: Operations controls-noise in freight yards	EPA/FRA	P.L. 92–574	NCA '72
	Pipeline	Water Pollution: Water use and recycling, seepage, and leeching into water supply	EPA	P.L. 95–217	CWA '77
		Land Use: Major pipeline construction as a growth inducer; land reclamation for major projects	EPA/DOI	P.L. 91–190	NEPA '69
	Waterway	Water Pollution: Dredging requirements (another constraint on waterway development)	ACE/EPA	P.L. 95–217	CWA '77
		Oil pollution from maintenance bilge-cleaning and accidental spills	EPA/DOT	P.L. 95–217	CWA '77

	General	Air Pollution: Air resource plans, i.e., impact of prevention-of-significant deterioration policy on growth and transportation movement	EPA	P.L. 95–95	CAAA '77
Intercity (Passenger, Freight)	Highway	Air Pollution: Mobile source controls (See Urban Market) Traffic controls	EPA	P.L. 95–95	CAAA '77
		Noise Pollution: Mobile source controls	EPA	P.L. 92–574	NCA '72
		Land Use: Construction of intercity highways	EPA/CEQ	P.L. 91–190	NEPA '69
	Rail	Noise Pollution: Operations controls in rail yards	EPA/FRA	P.L. 92–574	NCA '72
		General/Safety: Hazardous materials transport	DOT/EPA	P.L. 94–580	RCRA '76
	Pipeline	Water Pollution: Water use and recycling, seepage, and leeching into water supply	EPA	P.L. 95–217	CWA '77
		Land Use: Major pipeline construction requiring EIS; land reclamation	EPA/DOI	P.L. 91–190 P.L. 94–580	NEPA '69 & RCRA'76
	Waterway	Water Pollution: Dredging requirements	ACE	P.L. 95–217	CWA '77
		Oil pollution from maintenance bilge cleaning and accidental spills	EPA/DOT CG	P.L. 95–217 P.L. 95–474	CWA '77 PWSA '78
	Aviation	Noise Pollution: Aircraft retrofit	EPA/FAA	P.L. 92–574	NCA '72
		Operations controls	EPA/FAA	P.L. 94–301	AADAA '76
International (Passenger, Freight)	Marine Waterway	Water Pollution: Oil pollution from bilge-cleaning and accidental spills	EPA/CG	P.L. 95–474	PWSA '78
		Deepwater ports, oil pollution, hazards with onshore transport	EPA/ACE	P.L. 95–474 P.L. 95–217	PWSA '78 CWA '77
		Land Use: Deepwater ports-siting, EIS requirements	EPA/CEQ	P.L. 91–190	NEPA '69
	Aviation	Noise Pollution: Supersonic transport (e.g., Concorde)	EPA/FAA	P.L. 94–301	AADAA '76

SOURCE: Compiled in the course of NTPSC research.

KEY: Agencies:

ACE – U.S. Army Corps of Engineers
CEQ – Council on Environmental Quality
CG – U.S. Coast Guard
DOI – Department of Interior
DOT – Department of Transportation
EPA – Environmental Protection Agency
FAA – Federal Aviation Administration
FRA – Federal Railroad Administration

Legislation:

AADAA – Airport and Airway Development Act Amendments of 1976
CAAA – Clean Air Act Amendments of 1977
CWA – Clean Water Act of 1977
EPCA – Energy Policy and Conservation Acto of 1975
ESECA – Energy Supply and Environmental Coordination Act of 1974
NCA – Noise Control Act of 1972
NEPA – National Environmental Policy Act of 1969
PWSA – Ports and Waterways Safety Act of 1978

APPENDIX TABLE 17. Safety regulations affecting transportation

Type of Safety Regulation	Regulatory Agencies		Affected Modes	Predominant Markets
1. *Qualification and Fitness of Operators*	DOT–BMCS, NHTSA		Highway	Urban, Rural, Intercity
	DOT–FRA		Rail	
a. training	ABS, CG–OCVS, MARAD–OMMS		Waterway	Intercity, International
b. supervision	NFPA, DOI, DOE, DOT		Pipeline	
c. alertness	DOT–FAA		Aviation	
d. accident reports				
2. *Physical Condition of Designated "Ways", Vehicles and Crafts*	DOT–FHWA, NHTSA		Highway	Urban, Rural, Intercity
	DOT–FRA		Rail	
a. deterioration	ABS, CG–OCVS, MARAD–OMMS		Waterway	Intercity, International
b. deferred maintenance	NFPA, DOI, DOE, DOT		Pipeline	
c. inspection programs	DOT–FAA		Aviation	
d. accident reports				
e. establish standards				
3. *Sources and Methods of Enforcement*	DOT–FHWA	NTSB	Highway	Urban, Rural, Intercity
	DOT–FRA		Rail	
a. inspection programs	CG–OCVS, MARAD–OMMS,		Waterway	Intercity, International
b. Federal capital grant funds	ABS			
c. contingency funds	NFPA, DOI, DOE, DOT		Pipeline	
d. driver education	DOT–FAA		Aviation	
e. emergency medical services				
f. state use of police powers				
g. special agent enforcement				
h. special station inspections (i.e.				
h. truck scale stations)				
i. accident reporting				
4. *Hazardous Materials Handling Accidents*	NFPA, DOT–FHWA	DOT OMHO–OST	Highway	Urban, Rural, Intercity
	NFPA, DOT–FRA		Rail	
a. vehicle collisions	ABS, CG–OCVS, MARAD–OMMS		Waterway	Intercity, International
b. vehicle derailments				
c. properties of substance	NFPA, DOI, DOE, DOT		Pipeline	
1. flammable	DOT–FAA		Aviation	
2. explosive				
3. toxic				
4. radioactive				
d. technical handling knowledge				
e. vehicle design specifications				
f. accident reports				
5. *Provision of Safe "Ways" for Transport Operations*	*DOT–FHWA, NHTSA*		*Highway*	*Urban, Rural, Intercity*
a. removing obstructions	*DOT–FRA*		*Rail*	
b. betterment of existing ways	*CG–Aid to Navigation Program*		*Waterway*	*Intercity, International*
c. traffic service operations	*NFPA, pipeline operators and state regulators*		*Pipeline*	
d. way design specifications				
e. traffic engineering	*DOT–FAA*		*Aviation*	
f. weather information				

SOURCE: Compiled in the course of NTPSC research.

KEY:

ABS = American Bureau of Shipping
BMCS = Bureau of Motor Carrier Safety
CG = U.S. Coast Guard
DOE = Department of Energy
DOI = Department of Interior
DOT = Department of Transportation
FAA = Federal Aviation Administration
FHWA = Federal Highway Administration
FRA = Federal Railroad Administration
MARAD = Maritime Administration
NFPA = National Fire Protection Association
NHTSA = National Highway Traffic Safety Administration
NTSB = National Transportatin Safety Board (independent agency)
OCVS = Office of Commercial Vessel Safety
OHMO = Office of Hazardous Material Operation
OHMS = Office of Merchant Marine Safety

APPENDIX TABLE 18. **Estimated nationwide air pollutant emission trends, 1940–1976 (millions of tons per year for continental U.S.A.)**

Year	CO	HC	NO$_x$
1940	72.5	16.6	6.5
1950	82.9	21.8	8.8
1960	98.6	25.8	11.4
1968	111.4	29.7	19.5
1969	115.1	28.7	21.1
1970	100.7	27.3	22.1
1970	99.8	29.7	20.4
1971	100.2	29.3	21.3
1972	102.0	29.7	22.2
1973	98.3	29.8	22.9
1974	91.5	28.6	22.6
1975	85.9	26.2	22.2
1976	87.2	27.9	23.0

SOURCES: 1940-1970 data: U.S. Environmental Protection Agency, *Air Quality and Emission Trends*, National Air Monitoring Annual Report, Vol. I, DOC/450–1–73–001a, Washington, D.C.: 1973, p. 1-13; 1970-1976 data (includes new figures for 1970): U.S. Environmental Protection Agency, Office of Air and Waste Management, Office of Air Quality Planning and Standards, *National Air Quality and Emission Trends Report*, 1976, EPA–450/1–77–002, Research Triangle Park, North Carolina: December 1977, p. 5–1.

APPENDIX TABLE 19. **Forecasted emissions, medium-growth scenario (daily urban), (thousands of metric tons)**

Pollutant	1975	1980	1990	2000
CO	116.4	99.2	45.8	47.2
HC	15.8	12.2	5.8	6.4
NO$_x$	10.4	9.2	7.4	8.9

SOURCE: NTPSC forecasts.

APPENDIX TABLE 20. Ranking of countermeasures by decreasing cost effectiveness in present value dollars per total fatalities forestalled—10-year total.[a]

Countermeasures	Fatalities Forestalled	Cost ($ millions)	Dollars per Fatality Forestalled
Mandatory Safety Belt Usage	89,000	45.0	506
Highway Construction and Maintenance Practices	459	9.2	20,000
Upgrade Bicycle and Pedestrian Safety Curriculum Offerings	649	13.2	20,400
Nationwide 55-mph Speed Limit	31,900	676.0	21,200
Driver Improvement Schools	2,470	53.0	21.400
Regulatory and Warning Signs	3,670	125.0	34,000
Guardrail	3,160	108.0	34,100
Pedestrian Safety Information and Education	490	18.0	36,800
Skid Resistance	3,740	158.0	42,200
Bridge Rails and Parapets	1,520	69.8	46,000
Wrong-Way Entry Avoidance Techniques	779	38.5	49,400
Driver Improvement Schools for Young Offenders	692	36.3	52,500
Motorcycle Rider Safety Helmets	1,150	61.2	53,300
Motorcycle Lights-On Practice	65	5.2	80,600
Impact-Absorbing Roadside Safety-Devices	6,780	735.0	108,000
Breakaway Sign and Lighting Supports	3,250	379.0	116,000
Selective Traffic Enforcement	7,560	1,010.0	133,000
Combined Alcohol Safety Action Countermeasures	13,000	2,130.0	164,000
Citizen Assistance of Crash Victims	3,750	784.0	209,000
Median Barriers	529	121.0	228,000
Pedestrian and Bicycle Visibility Enhancement	1,440	332.0	230,000
Tire and Braking System Safety Critical Inspection-Selective	4,591	1,150.0	251,000
Warning Letters to Problem Drivers	192	50.5	263,000
Clear Roadside Recovery Area	533	151.0	284,000
Upgrade Education and Training for Beginning Drivers	3,050	1,170.0	385,000
Intersection Sight Distance	468	196.0	420,000
Combined Emergency Medical Countermeasures	8,000	4,300.0	538,000
Upgrade Traffic Signals and Systems	3,400	2,080.0	610,000
Roadway Lighting	759	710.0	936,000
Traffic Channelization	645	1,080.0	1,680,000
Periodic Motor Vehicle Inspection-Current	1,840	3,890.0	2,120,000
Pavement Markings and Delineators	237	639.0	2,700,000
Selective Access Control for Safety	1,300	3,780.0	2,910,000
Bridge Widening	1,330	4,600.0	3,460,000
Railroad-Highway Grade Crossing Protection (Automatic gates excluded)	276	974.0	3,530,000
Paved or Stabilized Shoulders	928	5,380.0	5,800,000
Road Alignment and Gradient	590	4,530.0	7,680,000

SOURCE: Department of Transportation, *National Highway Safety Needs Report*, April 1976.

[a] All figures have been rounded to three significant digits after internal computations were completed. All figures are subject to the caveats concerning precision of the data.

APPENDIX TABLE 21. **Forecast consumption of energy products by the transportation sector, 1975 to 2000, national distributed transportation fuel consumption, medium-growth scenario (quadrillion Btu per year)**

Fuel	Year 1975	1985	2000	Average Annual Growth 1975 to 2000
Gasoline	12.73	12.62	8.78	1.5%
Diesel	2.22	4.31	7.55	5.0%
Jet	2.00	2.98	4.96	3.7%
Marine Bunker	0.39	0.57	0.89	3.4%
Methanol	—	0.18	.50	—
Electricity[a]	—	—	.08	—
Total[b]	17.35	20.68	22.76	1.1%

SOURCE: NTPSC forecasts.

[a] Automobile electric consumption only; rail use of electricity is included in the industrial sector.

[b] Totals may not add due to rounding.

APPENDIX TABLE 22. **Prices of leading primary energy products, 1975 to 2000, medium-growth scenario, marginal prices[a] of principal primary energy resources, (mid-1975 dollars per million Btu)**

Resource	1975	1980	1985	1990	1995	2000
Domestic Crude Oil	2.07	2.54	2.85	2.98	3.04	3.29
Crude Imports[b]	2.20	2.20	2.98	2.96	3.27	3.43
High-Sulfur Coal	.50	.63	.70	.71	.73	.70
Low-Sulfur Coal	.63	.80	.85	.84	.81	.73
Domestic Natural Gas	2.04	2.34	2.78	2.86	2.93	3.06
Imported LNG	—	2.70	3.28	3.46	3.77	3.93
Domestic LPG	2.64	2.77	3.25	3.27	3.40	3.68
Imported LPG	2.70	2.70	3.28	3.46	3.77	3.93
Nuclear Fuel[c]	.44	.48	.49	.49	.50	.50

SOURCE: NTPSC forecasts.

[a] Wellhead and minemouth prices assuming no energy price regulation.

[b] Including petroleum products.

[c] Based on uranium (LL_3O_8) prices.

APPENDIX TABLE 23. **Forecast primary energy production for the U.S., 1975 to 2000, medium-growth scenario, production of primary energy resources (quadrillion Btu per year)**

Resource	1975	1980	1985	1990	1995	2000
Solar	—	0.11	0.40	0.79	1.24	1.70
Biomass	—	—	0.01	0.23	0.54	0.98
Hydro and Geothermal	3.29	3.54	3.71	3.73	3.77	3.61
Nuclear Fuel	1.69	3.81	7.31	12.28	18.13	23.22
High-Sulfur Coal	7.05	6.80	6.90	7.72	9.71	14.20
Low-Sulfur Coal	7.55	14.10	18.98	23.55	29.50	38.68
Raw Shale Oil	—	—	0.04	0.14	0.21	2.46
Domestic Crude	18.60	15.97	15.47	16.63	19.82	18.80
Crude Imports[a]	11.73	19.30	20.68	20.42	17.42	14.10
Gas Imports[b]	1.07	2.74	2.94	3.41	3.47	3.97
Domestic LPG	1.87	2.03	2.25	2.03	1.86	1.69
Domestic Natural Gas	18.72	18.44	17.75	16.98	16.66	14.92
Totals[c]	71.57	86.83	96.44	107.89	122.32	138.33

SOURCE: NTPSC forecasts.

[a] Including petroleum products and small quantities of imported methanol.

[b] Includes LPG, LNG and Canadian Gas.

[c] Totals may not add due to data rounding.

APPENDIX TABLE 24. **Forecast consumption of energy products in the transportation sector, 1975 to 2000, medium-growth scenario (quadrillion Btu per year)**

Product	1975	1980	1985	1990	1995	2000
Gasoline	12.733	14.688	12.615	10.459	9.388	8.776
Diesel Auto and Local Trucks	—	0.066	0.906	1.601	2.022	2.341
Diesel, Non-auto[c]	2.218	2.880	3.424	4.010	4.605	5.206
Jet Fuel	2.008	2.484	2.985	3.595	4.229	4.965
Marine Bunker[b]	0.388	0.478	0.568	0.672	0.776	0.890
Methanol	—	0.013	0.181	0.330	0.428	0.504
Electricity[a]	—	—	—	0.020	0.049	0.080
Total	17.347	20.609	20.679	20.687	21.497	22.762

SOURCE: NTPSC forecasts.

[a] For electric cars.

[b] Excludes marine diesel.

[c] Intercity truck, bus, rail, and marine diesel.

APPENDIX TABLE 25. Constraining locks on the inland waterway system

	Lock		
Waterway	U.S. Dept. of Transportation[a] (By 1990)	Manalytics[b] (By 1976)	Mid America Ports Study[c] (By 2000)
Mississippi River	L&D 26	L&D 26	L&D 26
Gulf Intracoastal Waterway	Inner Harbor	Industrial	Inner Harbor
	Vermillion	Vermillion	Vermillion
	Port Allen	—	Port Allen
	—	Bayou Sorrel	—
Kanawha River	Winfield LS.	Winfield LS	—
Ohio River	Gallipolis	—	Gallipolis
Monongahela River	L.3	L.3	—
	L.4	—	—
	L.7	—	—
	L.8	—	—
Illinois River	La Grange	—	Peoria
	Starved Rock	—	Marseilles
	Dresden Island	—	Dresden Island
	Brandon	—	Brandon
	Lockport	—	Lockport
Tennessee River	—	—	Kentucky

[a] U.S. Department of Transportation, *National Transportation Trends and Choices*, 1977, p. 257.

[b] Manalytics, Inc., *Coal Transportation Capability 1985 and Beyond*, 1976, p. 57.

[c] Preliminary findings, of Mid-America Ports Study prepared for U.S. Department of Commerce by Tippetts-Abbett-McCarthy-Stratton, 1978.

APPENDIX TABLE 26. Characteristics of constraining locks on the mid-America inland waterway system

		Tons (Millions)		
Waterway	Lock and Dam	Estimated Annual Capacity	1976 Demand	Year Capacity Is Reached
Illinois	Marseilles	32	25.8	1983
	Starved Rock	36	27.2	1985
	Brandon Road	32	23.1	1989
	Dresden Island	35	25.4	1989
	Lockport	33	22.5	1992
	Peoria	57	33.2	1994
	LaGrange	59	30.7	1998
Tennessee	Kentucky	31	21.8	1991
Ohio	Gallipolis	[a]47	[f]33.8	1996
Mississippi	L&D 26[b]	[c]73	54.5	1984
Gulf Intercoastal	Inner Harbor[d]	30	30.4	Current
	Port Allen	30	20.2	1993
	Vermilion[e]	45	40.3	1996

SOURCE: Preliminary findings of the Mid-America Ports Study prepared for the U.S. Department of Commerce by Tippets-Abbett-McCarthy-Stratton, 1978.

[a] Practical capacity estimate prepared by Corps of Engineers.

[b] New Locks and Dam 26 are authorized.

[c] Practical capacity estimate prepared by Corps of Engineers, assumes use of switch boats.

[d] New Lock and channel authorized as part of the Mississippi River Gulf Outlet project which connects the outlet with the Mississippi River and could affect traffic volumes through Inner Harbor Lock.

[e] Replacement lock for Vermilion Lock is authorized.

[f] 1975 figure.

APPENDIX TABLE 27. Forecasts of urban person-trips for three scenarios (millions)

Year	Low-Growth Scenario	Medium-Growth Scenario	High-Growth Scenario
1975	359.4	359.4	359.4
1980	376.3	379.9	378.3
1990	399.2	424.4	419.0
2000	422.6	462.7	448.0

SOURCE: NTPSC forecasts.

APPENDIX TABLE 28. City group comparisons of 1975 and year 2000, medium-growth scenario (percent daily trips by transit)

City Group	1975	2000
1	1.3	1.2
2	1.6	1.6
3	2.1	2.0
4	3.3	2.8
5	6.4	9.3
6	19.4	16.9

SOURCE: NTPSC forecasts.

APPENDIX TABLE 29. Arterial highway miles (thousands)

Facility Type	1975	1980	1990	2000
Freeway	12.9	15.0	20.7	26.5
Surface Arterial	92.0	93.7	99.0	104.5
Total	104.9	108.7	119.7	131.0

SOURCE: NTPSC forecasts.

APPENDIX TABLE 30. City group comparisons of 1975 and year 2000, percent of arterial mileage which is freeway

City Group	1975	2000
1	10.5	17.2
2	12.1	19.7
3	12.6	21.0
4	12.9	20.6
5	11.7	19.6
6	13.1	21.9

SOURCE: NTPSC forecasts.

APPENDIX TABLE 31. Average daily urban transit seat-miles (millions)

Mode	1975	1980	1990	2000
Bus	232.6	303.8	352.9	433.9
Rail	172.7	212.9	323.1	437.4

SOURCE: NTPSC forecasts.

APPENDIX TABLE 32. City group[a] comparison of 1975 and year 2000, medium-growth scenario, peak and off-peak period[b] highway speed on urban arterials

City Group	Peak Period		Off-Peak Period	
	1975	2000	1975	2000
1	32.0	33.9	32.5	36.2
2	31.0	31.1	31.8	36.1
3	32.5	29.4	33.7	36.1
4	29.8	30.5	32.2	37.1
5	25.7	19.3	33.1	36.7
6	29.2	30.5	31.1	38.8

SOURCE: NTPSC forecasts.

[a] City groups based on expected population in 1990.

[b] Virtually identical results for all scenarios.

APPENDIX TABLE 33. Forecasts for three scenarios over time: private urban personal passenger vehicle fleet (millions)

Scenario	1975	1980	1990	2000
Low-Growth	53.8	61.3	75.7	91.3
Medium-Growth	53.8	61.8	80.4	100.1
High-Growth	53.8	61.6	79.5	96.9

SOURCE: NTPSC forecasts.

APPENDIX TABLE 34. Projections of truck-miles in urban goods movement, by scenario, 1975 to 2000 (hundred millions)

Scenario	1975	1980	1990	2000
Low-Growth	30.7	35.8	41.5	45.9
Medium-Growth	30.7	36.7	51.2	71.7
High-Growth	30.7	37.2	57.2	90.6

SOURCE: NTPSC forecasts.

APPENDIX TABLE 35. Projections of operation costs[a] of trucks in urban goods movement, by scenario, 1975 to 2000 (billions of $)

Scenario	1975	1985	2000
Low-Growth	48.1	61.2	71.8
Medium-Growth	48.1	68.3	111.1
High-Growth	48.1	71.5	139.1

SOURCE: Medium-growth Scenario based on A.T. Kearney, Inc., *Urban Goods Movement Demonstration Project Design Phase IV,* Chicago, Illinois: March, 1976. Other scenarios based on adjustments according to GNP.

APPENDIX TABLE 36. Forecast movements of intercity goods, by scenario, 1975 to 2000 (billions of tons)

Scenario	1975	1985	2000
Low-Growth	3.90	4.70	5.05
Medium-Growth	3.90	5.39	8.09
High-Growth	3.90	5.99	10.43

SOURCE: NTPSC forecasts.

APPENDIX TABLE 37. Forecast movements of intercity goods by mode,[a] 1975 to 2000 (billions of ton-miles)[b]

	1975	1985	2000
Low-Growth Scenario			
Rail	673	973	1,153
Motor Carrier	293	454	542
Private Truck	195	281	332
Water	428	678	967
Oil Pipeline	437	459	679
Gas Pipeline	312	252	300
Air Freight	4	5	62
Total	2,342	3,102	3,978
Medium-Growth Scenario			
Rail	673	1,146	1,983
Motor Carrier	293	516	841
Private Truck	195	316	525
Water	428	764	1,433
Oil Pipeline	437	497	1,062
Gas Pipeline	312	235	356
Air Freight	4	6	10
Total	2,342	3,480	6,209
High-Growth Scenario			
Rail	673	1,312	2,651
Motor Carrier	293	524	1,020
Private Truck	195	341	638
Water	428	810	1,629
Oil Pipeline	437	566	1,264
Gas Pipeline	312	242	402
Air Freight	4	7	13
Total	2,342	3,801	7,616

SOURCE: NTPSC forecasts.

[a] See footnote 6, Chapter 9.

[b] Figures may not add due to rounding.

APPENDIX TABLE 38. Forecast shares of intercity freight ton-miles by mode, 1975 to 2000[a]

	1975	1985	2000
Low-Growth Scenario			
Rail	.287	.314	.290
Truck	.208	.237	.220
Water	.183	.218	.243
Oil Pipeline	.186	.148	.171
Gas Pipeline	.133	.081	.075
Air	.002	.002	.002
Medium-Growth Scenario			
Rail	.287	.329	.319
Truck	.208	.239	.220
Water	.183	.219	.231
Oil Pipeline	.186	.143	.171
Gas Pipeline	.133	.067	.057
Air	.002	.002	.002
High-Growth Scenario			
Rail	.287	.345	.348
Truck	.208	.228	.218
Water	.183	.213	.214
Oil Pipeline	.186	.149	.166
Gas Pipeline	.133	.064	.053
Air	.002	.002	.002

SOURCE: NTPSC forecasts.

[a] Goods movement includes the 19 commodity classes covered in the 1972 data base of the Transportation System Center of DOT. Intercity flows are those of sufficient length to cross Bureau of Economic Analysis region boundaries. Except for coal movement, which is covered in Chapter 8, shorter truck movements are covered in this chapter in the Urban Goods and Rural Goods sections. Shorter movements by pipeline, rail and water are not included. In 1975, these short movements accounted for about 12% of total ton-miles.

APPENDIX TABLE 39. Forecast local rural passenger travel, 1975 to 2000 (billions of vehicle-miles)

Scenario	1975	1980	1990	2000
Low-Growth	209.0	230.7	318.0	367.4
Medium-Growth	209.0	225.4	258.5	278.1
High-Growth	209.0	228.6	281.6	317.9

SOURCE: NTPSC forecasts.

APPENDIX TABLE 40. Forecast of truck-miles in rural goods movement, 1975 to 2000 (billions)

Scenario	1975	1980	1990	2000
Low-Growth	98.1	118.2	135.8	150.8
Medium-Growth	98.1	122.2	167.6	235.2
High-Growth	98.1	124.6	188.0	301.9

SOURCE: NTPSC forecasts.

APPENDIX TABLE 41. Forecast international aviation passenger-miles, by market, by scenario, 1975 to 2000[a] (billions)

Market	1975	1980	1985	1990	1995	2000	Ratio 2000/1975
Trans-Atlantic							
Low-Growth	42.637	59.801	71.541	74.491	84.794	89.252	2.09%
Medium-Growth	42.637	63.376	86.100	110.517	135.954	162.115	3.80%
High-Growth	42.637	65.903	96.833	135.813	182.694	236.510	5.55%
Latin America							
Low-Growth	16.732	23.577	29.046	33.007	36.016	38.154	2.28%
Medium-Growth	16.732	24.928	34.979	46.854	59.999	74.591	4.46%
High-Growth	16.732	25.886	39.031	57.244	80.626	108.713	6.50%
Trans-Pacific							
Low-Growth	18.585	28.062	35.900	42.948	48.426	53.152	2.86%
Medium-Growth	18.585	30.068	43.975	60.448	78.853	99.637	5.36%
High-Growth	18.585	31.985	51.559	78.245	111.862	152.829	8.22%
U.S. Total							
Low-Growth	77.954	111.440	136.487	155.446	169.236	180.558	2.32%
Medium-Growth	77.954	118.672	165.054	217.819	274.806	337.343	4.32%
High-Growth	77.954	123.774	187.693	271.302	375.182	498.061	6.39%

SOURCE: NTPSC forecasts.

[a] Passengers entering or departing U.S. on U.S.- or foreign-flag carriers.

APPENDIX TABLE 42. Forecasts of international cargo tons handled at U.S. airports, by market, by scenario, 1975 to 2000 and annual percent change.[a]

	1975	1980	1985	1990	1995	2000	Ratio Percent
EXPORTS							
Tran-Atlantic							
Low-Growth	394,951	565,423	709,691	830,745	925,784	1,013,153	2.57
Medium-Growth	394,951	601,377	885,562	1,284,166	1,810,386	2,490,884	6.31
High-Growth	394,951	628,175	1,020,449	1,683,418	2,745,845	4,306,847	10.90
Latin America							
Low-Growth	219,761	312,863	396,268	466,338	527,876	576,843	2.62
Medium-Growth	219,761	329,851	484,012	700,818	994,934	1,386,990	6.23
High-Growth	219,761	342,495	544,855	883,493	1,396,555	2,199,515	10.01
Trans-Pacific							
Low-Growth	163,873	265,964	368,347	480,958	590,240	685,247	4.18
Medium-Growth	163,873	287,468	474,866	759,846	1,154,709	1,673,989	10.22
High-Growth	163,873	308,800	578,576	1,068,821	1,871,049	3,062,976	18.69
U.S. Total							
Low-Growth	778,585	1,144,250	1,474,306	1,778,041	2,043,900	2,275,243	2.92
Medium-Growth	778,585	1,218,696	1,844,440	2,744,830	3,960,029	5,551,863	7.13
High-Growth	778,585	1,279,470	2,143,880	3,635,732	6,013,449	9,569,338	12.29
IMPORTS							
Trans-Atlantic							
Low-Growth	218,718	351,767	435,229	481,235	509,802	528,421	2.42
Medium-Growth	218,718	381,390	548,299	695,910	836,553	951,109	4.35
High-Growth	218,718	402,439	634,693	876,547	1,141,275	1,369,284	6.26
Latin America							
Low-Growth	88,472	148,076	188,178	218,468	242,154	258,309	2.92
Medium-Growth	88,472	160,812	237,134	333,163	445,847	569,026	6.43
High-Growth	88,472	169,599	271,407	423,372	633,093	884,632	10.00
Trans-Pacific							
Low-Growth	116,335	206,123	269,650	330,126	384,754	428,142	3.68
Medium-Growth	116,335	217,623	343,052	490,964	672,663	879,144	7.56
High-Growth	116,335	246,245	414,377	646,392	986,369	1,408,830	12.11
U.S. Total							
Low-Growth	423,525	705,966	893,057	1,029,829	1,136,710	1,214,872	2.87
Medium-Growth	423,525	759,825	1,128,485	1,520,037	1,955,063	2,399,279	5.67
High-Growth	423,525	818,283	1,320,477	1,946,311	2,760,737	3,662,746	8.65
U.S. GRAND TOTAL							
Low-Growth	1,201,110	1,850,216	2,367,363	2,807,870	3,180,610	3,491,115	2.91
Medium-Growth	1,201,110	1,978,521	2,972,925	4,264,867	5,915,092	7,951,142	6.62
High-Growth	1,201,110	2,097,753	3,464,357	5,582,043	8,774,186	13,232,084	11.02

SOURCE: NTPSC forecasts.

[a] Freight entering or departing U.S. on U.S.- or foreign-flag carriers.

APPENDIX TABLE 43. All cargo aircraft operations at U.S. airports, by market, 1975 to 2000[a]

	1975	1980	1985	1990	1995	2000
Trans-Atlantic						
Low-Growth	13,842	18,584	23,872	25,069	26,241	27,556
Medium-Growth	13,842	20,316	31,439	40,877	58,938	84,582
High-Growth	13,842	24,456	38,596	58,092	92,729	141,189
Latin America						
Low-Growth	—	818	7,957	4,147	5,831	6,947
Medium-Growth	—	1,520	11,624	9,900	19,807	34,931
High-Growth	—	2,099	7,776	14,179	27,564	47,465
Trans-Pacific						
Low-Growth	4,974	8,589	12,281	13,258	16,229	18,864
Medium-Growth	4,974	9,513	16,430	21,758	35,271	56,704
High-Growth	4,974	10,754	19,599	33,121	62,605	87,102
U.S. Total						
Low-Growth	18,816	27,991	44,110	42,474	48,481	53,367
Medium-Growth	18,816	31,349	59,493	72,535	114,016	176,217
High-Growth	18,816	37,309	65,971	105,392	182,898	275,756

SOURCE: NTPSC forecasts.

[a] Freight entering or departing U.S. on U.S.- or foreign-flag carriers.

APPENDIX TABLE 44. Alternative 1976 to 1990 highway capital needs by state[a] (millions of 1975 $)

	National Transportation: Trends and Choices Capital Needs 1976–1990[b]	Economic Analysis Capital Needs 1976–1990[c]
Alabama	5,623	5,054
Alaska	5,244	395
Arizona	9,245	3,912
Arkansas	3,561	3,239
California	18,422	22,236
Colorado	4,637	2,318
Connecticut	3,620	4,204
Delaware	1,195	227
D.C.	2,872	1,781
Florida	28,295	18,768
Georgia	12,002	6,680
Hawaii	3,378	1,520
Idaho	1,253	241
Illinois	35,537	13,547
Indiana	10,348	5,137
Iowa	13,448	4,969
Kansas	6,044	2,274
Kentucky	4,353	3,339
Louisiana	11,796	7,094
Maine	1,544	502
Maryland	8,967	6,505
Massachusetts	9,100	9,424
Michigan	12,312	12,781
Minnesota	6,894	1,925
Mississippi	5,576	1,695
Missouri	22,339	10,230
Montana	2,456	885
Nebraska	3,091	266
Nevada	1,321	962
New Hampshire	1,346	916
New Jersey	22,501	14,472
New Mexico	2,265	670
New York	52,259	32,485
North Carolina	22,264	10,768
North Dakota	1,937	216
Ohio	12,282	12,420
Oklahoma	2,377	1,473
Oregon	3,055	2,911
Pennsylvania	17,767	11,252
Rhode Island	1,918	2,522
South Carolina	5,884	1,335
South Dakota	1,567	126
Tennessee	11,657	7,109
Texas	50,655	26,336
Utah	1,612	1,078
Vermont	831	507
Virginia	10,875	8,574
Washington	7,531	3,440
West Virginia	4,122	1,625
Wisconsin	18,160	11,641
Wyoming	1,746	693
National Total[d] (Excluding Puerto Rico, Samoa, Guam, and the Virgin Islands)	513,721	304,679

[a] 1. Both sets of estimates were made prior to the 1973 oil embargo and do not reflect change since the basic data were reported.

2. The U.S. DOT has not published state-by-state capital needs for the alternatives reported in *"The Status of the Nation's Highways: Conditions and Performance."* The "Basic" alternative from this report was the basis for the 1976–2000 needs reported.

[b] As reported by the states minus 1972–1975 expenditures by state and functional class reported in *The Status of the Nation's Highways: Conditions and Performance,* U.S. Dept. of Transportation, Sept.1977, U.S. Government Printing Office, Committee Print, Committee on Public Works and Transportation.

[c] Developed by the NTPSC from the following sources: U.S. Department of Transportation, *1976 Interstate Highway Cost-to-Complete Study,* Arterial and Collector Highway Estimates from unpublished computer printout of an Economic Analysis of the 1972 Highway Needs. The nationwide totals were reported in the U.S. Department of Transportation, *1972 National Highway Needs Report,* Washington, D.C.: 1972; Local roads as reported by states for the U.S. Department of Transportation, *1974 National Transportation Report,* Washington, D.C.: 1974. All statistics modified by NTPSC using 1975 constant dollars.

[d] Totals vary slightly from those in Table 41 due to small differences in accounting methods and the inclusion in Table 41 of reported needs for Puerto Rico, Samoa, Guam, and the Virgin Islands.

APPENDIX TABLE 45. Excise taxes accruing to the highway trust fund by tax rate in 1979

Motor Fuels	
Gasoline	4 cents per gallon
Diesel	4 cents per gallon
Special motor fuels	4 cents per gallon
Rubber	
Tires	10 cents per pound
Tubes	10 cents per pound
Retreads	5 cents per pound
New Trucks and Trailers (over 10,000 pounds)	10 percent of manufacturer's wholesale price
Annual Heavy-Vehicle Use Tax	$3 per 1,000 pounds when gross weight exceeds 26,000 pounds
Motor Vehicle Parts and Accessories	8 percent of manufacturer's wholesale price
Lubrication Oil (for highway use)	6 cents per gallon

SOURCE: U.S. Department of Transportation, Federal Highway Administration. *Federal Laws and Material Relating to the Federal Highway Administration,* Washington, D.C.: November 1976.

APPENDIX TABLE 46. Estimates of for-hire trucking employment, 1975 to 2000 (in thousands)

	Employment		
	Scenario		
Year	Low-Growth	Medium-Growth	High-Growth
1975	996.4	996.4	996.4
1980	933.6	952.3	963.9
1985	1,019.2	998.6	1,041.7
1990	995.6	993.3	1,024.8
1995	1,044.0	1,062.0	1,090.6
2000	1,111.9	1,136.6	1,161.3

SOURCE: Jack Faucett Associates estimates based on projections of past trends in employment to output ratios and NTPSC activity forecasts.

APPENDIX TABLE 47. Estimates of intercity bus employment in Class I, II and III carriers (in thousands)

	Scenario		
Year	Low-Growth	Medium-Growth	High-Growth
1975	[a]46.7	[a]46.7	[a]46.7
1985	46.3	50.9	55.2
2000	46.3	56.9	61.7

SOURCE: The NTPSC computed employment figures based on employment/revenue output from historical data obtained from the ICC in 1978.

[a] 1975 figures revised but still preliminary.

APPENDIX TABLE 48. Estimates of railroad employment, 1975 to 2000 (in thousands)

	Employment		
	Scenario		
Year	Low-Growth	Medium-Growth	High-Growth
1975	542.4	542.4	542.4
1980	495.4	519.8	544.4
1985	519.8	548.8	591.2
1990	498.5	541.2	583.8
1995	479.3	537.4	577.3
2000	474.0	542.6	583.3

SOURCE: NTPSC estimates made by Jack Faucett Associates.

APPENDIX TABLE 49. FAA labor requirements for air traffic control facilities, 1980 to 2000 (in thousands)[a]

Year	Enroute	Tower
1980	12.1 to 14.3	12.7 to 14.2
1985	15.9 to 18.8	16.6 to 19.2
1990	20.8 to 24.5	21.1 to 24.4
1995	24.1 to 28.5	24.6 to 28.4
2000	27.3 to 32.2	27.8 to 32.3

SOURCE: U.S. Federal Aviation Administration, Office of Aviation Policy, *An Econometric Analysis of Enroute and Terminal Air Traffic Control,* Washington, D.C.: WDC, June 1976.

[a] Ranges due to different assumptions regarding the cost of capital.

APPENDIX TABLE 50. Forecast of number of airline employees in total U.S. and domestic U.S. operations, 1975 to 2000 (thousands of jobs)

	1975	1980	1985	1990	1995	2000
Low-Growth Scenario						
Airline Employment	382	355	323	333	336	372
Percent of Revenue for Domestic Operations	77.6	79.0	80.8	81.7	82.6	83.2
Estimated Domestic Operations Employment	296	280	261	272	278	310
Medium-Growth Scenario						
Airline Employment	382	413	379	422	451	523
Percent of Revenue for Domestic Operations	76.8	76.8	76.9	76.9	77.2	76.6
Estimated Domestic Operations Employment	293	317	291	325	348	401
High-Growth Scenario						
Airline Employment	382	378	361	411	457	559
Percent of Revenue for Domestic Operations	76.8	76.9	77.1	77.3	77.5	77.2
Estimated Domestic Operations Employment	293	291	278	318	354	432

SOURCE: NTPSC estimates by Jack Faucett Associates, based on the use of two techniques: replacement values were computed using continuing inventory accounting techniques; expansion values were based on projections of historical trends in capital-output ratios.

APPENDIX TABLE 51. Forecast inland waterway trust fund revenues, 1985 and 2000, by scenario (millions of 1975 $)

	Scenario					
	Low-Growth		Medium-Growth		High-Growth	
	1985	2000	1985	2000	1985	2000
Revenue	39	38	43	43	41	40

SOURCE: NTPSC estimates.

NOTE: Inflation rates used in calculating this table are the standard rates employed in developing the scenarios.

APPENDIX TABLE 52. U.S. Coast Guard expenditures, 1950 to 1975

	Operating Expense			Acquisition Construction and Improvement				
		Aids to Navigation			Aids to Navigation			
Year	Total Million $	Million $	%	Total Million $	Domestic $	Int'l $	Total $	%
1950	126.55	41.55	33	7.67	1.17	0.79	1.96	26
1955	154.80	20.66	13	7.89	0.30	0.21	0.51	6
1960	189.24	31.98	17	23.25	1.46	0.98	2.44	10
1965	273.63	64.48	24	85.65	6.19	4.13	10.32	12
1970	424.85	87.81	21	67.10	11.58	7.72	19.30	29
1975	659.40	136.70	21	84.59	13.77	9.18	22.95	27

SOURCE: U.S. Coast Guard.

APPENDIX TABLE 53. Ownership of U.S. port facilities

Type of Ownership	Number of Terminals (Estimate)	Percent of U.S. Total (Estimate)
Private (profitmaking organizations)	1,488	62.00
Private (non-profitmaking organizations)	6	.25
Local government agencies	576	24.00
State government agencies	288	12.00
U.S. government agencies	43	1.75
Total	2,401	100.00

SOURCE: Estimates are extrapolated from data contained in Joint Economic Committee, U.S. Maritime Administration, *State and Local Facility Needs and Financing,* Volume I, prepared for U.S. Congress, Joint Economic Committee, Washington, D.C.: 1966, I–332.

APPENDIX TABLE 54. Projections of domestic and international marine transport shipboard employment, 1975 to 2000

	1975	1985	2000
Deep Sea:[a]			
Licensed	11,315		
Unlicensed	43,255		
Great Lakes:			
Licensed	1,618	1,690	
Unlicensed	5,154	5,370	
Inland Towing:			
Officers	21,000	35,870	60,100
Crew	49,000	83,700	140,200
Total	131,342	126,630	200,300

SOURCE: 1975 data from MarAd Office of Maritime Manpower. Projections by NTPSC.

[a] U.S.-flag, International and Domestic Ocean.

APPENDIX TABLE 55. U.S. international definitions

Water Freight: U.S. carriers' freight receipts for U.S. imports and exports. Foreign carriers' revenues from U.S. imports are treated as an import. Ten percent of the foreign freight charges paid to U.S.-flag carriers involved in trade between foreign countries is also included.

Air Freight: All international and territorial freight on U.S. airlines, including freight, express, excess baggage, adjusted mail and chartered freight. Payments accruing to foreign-flag carriers for purchases of services by U.S. citizens are excluded.

Air Passenger: Includes all passenger services of U.S. airlines to or from foreign countries and U.S. territories and between two foreign locations, plus purchases of foreign transport services by U.S. residents.

Water Passenger: Purchases by U.S. citizens of international passenger services originating in or destined for the U.S. regardless of flag of vessel.

APPENDIX TABLE 56. Intercity transportation definitions

Regulated Motor Carriage: Freight trucked beyond the local area and subject to economic regulation by the states or by the ICC.

Private Motor Carriage: Freight activities of private trucks that go beyond the local area. Includes labor costs only for driving and maintenance.

Rail Freight: Includes freight, express, baggage and farm commodities moving between cities by rail.

Domestic Ocean: Includes the intercoastal waterways, ship routes that use the ocean between U.S. ports (plus trips between coasts through the Panama Canal), and travel by water to Hawaii, Alaska, Puerto Rico, the Virgin Islands, Guam and Samoa.

Great Lakes: Includes all U.S. shipping on the Great Lakes and that portion of the St. Lawrence Seaway belonging to the U.S.

Inland Waterway: Normally refers to rivers, canals, and intracoastal waterways which service shallow-draft vessels (e.g., those of nine-foot draft).

Oil Pipeline: All intercity and local freight activities of crude oil and petroleum product pipelines.

Gas Pipeline: Pipelines that derive their revenue from the transmission and distribution of gas.

Air Freight: Freight carried on U.S. airlines within and between the 50 states. Includes freight, express, excess baggage, adjusted mail and chartered freight.

Automobiles: Figures are based on the sum of expenditures for ownership and operation of private vehicles. "Autos" include small trucks and vans used as personal vehicles.

Air Carrier: All domestic (those within and between the 50 states) passenger operations of U.S. airlines. This includes certificated route and supplemental air carriers and air taxis.

General Aviation: Not-for-hire business-owned aircraft used for passengers and/or freight shipments (includes civil government aircraft).

> Personal Aircraft. Use of personal aircraft for transportation.
>
> Other General Aviation Aircraft. Aircraft in the categories of aerial application, instructional, industrial/special, and other uses.

Rail Passenger: Railroads, Passenger. Fares, car charges, baggage and other passenger receipts.

Intercity Bus: Intercity and rural highway passenger transportation.

Water Passenger: Domestic Water, Passenger. Inland and coastal waterways, principally ferries, river cruise ships and coastal trips by international steamers.

APPENDIX TABLE 57. Operating cost of inland towing transport, by cost item, twelve months ending June 30, 1978

Cost Item	Cost[a]	% of Total Cost
Towboat		
Crew Wages and Fringes	40,457,115	13.78
Insurance	8,413,275	2.86
Depreciation–B.B. Charter[b]	8,166,845	2.78
Maintenance	14,341,924	4.88
Fuel	47,060,314	16.03
Lube	2,013,141	0.69
Other	11,851,053	4.04
Outside Towing	40,312,385	13.73
Barge		
Insurance	6,048,514	2.06
Depreciation–Charter	24,005,869	8.17
Maintenance	13,478,711	4.59
Other	2,976,960	1.01
Port		
Shifting–Fleeting–Other	37,015,940	12.60
Cargo		
Cleaning–Cargo Ins.	9,119,422	3.10
General and Administrative Costs	28,415,736	9.68
Total	293,677,204	100.00

SOURCE: ICC Suspension Board Case No. 68652 dated November 3, 1978.

[a] Based on seven firms' operations.

[b] "B.B." means "Bare Boat."

APPENDIX TABLE 58. Highway cost responsibility based on 1975 disbursement patterns[a] and 1975 user-charge percentages,[b] medium-growth scenario (millions of 1975 $)

	1975	1985	2000
Federal Disbursements	−7,741	−13,814	−19,519
Federal User Charge Revenues	+5,699	+10,170	+14,370
Net (Subsidy)	−2,042	−3,644	−5,149
State & Local Disbursements	−20,412	−36,436	−51,461
State & Local User Charge Revenues	+12,925	+23,071	+32,585
Net (Subsidy)	−7,487	−13,365	−18,876
Total Disbursements	−28,153	−50,250	−70,980
Total User Charge Revenues	+18,624	+33,241	+46,955
Net (Subsidy)	−9,529	−17,009	−24,025

SOURCE: NTPSC forecasts.

[a] The 1975 Federal, state and local shares of total disbursements have been retained and projected to 1985 and 2000.

[b] The 1975 ratios of revenues to disbursements at the Federal, state and local levels have been projected to 1985 and 2000.

APPENDIX TABLE 59. Federal tax schedules for the alternatives, 1975, 1985 and 2000

	1975	1985	2000
Fuel Tax	$0.04/gal	$0.058/gal	$0.078/gal
Rubber Tax	$0.10/lb	$0.123/lb	$0.123/lb
Trucks, Buses, & Trailers	10.0% wholesale value	11.1%	9.48%
Heavy Vehicle Use	$3.00/1000 lbs load for vehicles greater than 26,000 lbs	$2.94	$2.75
Lubricating Oil	$0.06/gal	$0.074/gal	$0.074/gal
Truck and Bus Parts and Accessories	8.0% of wholesale value	8.8%	7.6%

SOURCES: U.S. Department of Transportation, Highway Statistics, Summary to 1975. NTPSC estimates based on retaining each tax's proportionate contribution to total revenue in future years.

APPENDIX TABLE 60. Constant dollar 1975 and current dollar fuel taxes (constant federal user-charge percent) alternative ($ per gallon, medium-growth scenario, 1975 to the year 2000)

	1975 $				Current $[a]			
	Federal Fuel Tax	State & Local Fuel Tax	Pump Price Before Tax	Total	Federal Fuel Tax	State & Local Fuel Tax	Pump Price Before Tax	Total
1975	$ 040	$ 090	$ 490	$ 620	$ 040	$ 090	$ 490	$ 620
1985	.058	.131	.551	.740	.098	.221	.931	1.250
2000	.078	.176	.604	.858	.274	.616	2.120	3.010

SOURCE: NTPSC estimates.

[a] Actual GNP deflators used for 1976, 1977 and 1978, 5 percent annual inflation rate assumed for later years.

TABLE 61. Payments and expenditures occassioned by road types and vehicle class (1956 to 1975), ("Pay-As-You-Go"), (billions of current $)

Road Type	Common Expenditures	Autos and Light Trucks			Heavy and Medium Trucks and Buses		
		Occasioned Expenditures	Payments[a]	Difference: P–E	Occasioned Expenditures	Payments	Difference: P–E
Federally Aided							
Interstate Rural	31.6	nil			5.5		
Interstate Urban	28.4	nil			4.7		
Primary Rural	38.0	nil			8.8		
Primary Urban	23.0	nil			3.2		
Secondary Rural	35.7	0.2			13.1		
Secondary Urban	6.7	nil			0.9		
Non Federally Aided							
Other Rural	37.3	0.3			16.0		
Other Urban	42.6	0.3			9.9		
Total All Roads	243.1	0.8	209.7	+208.9	62.1	68.0	+5.9
All Rural	142.4	0.5	94.7	+ 94.2	43.4	43.9	+ .5
All Urban	100.7	0.3	115.0	+114.7	18.7	24.1	+5.4

SOURCE: The Urban Institute, *An Analysis of Road Expenditures and Payments by Vehicle Class (1956–1975)*, Washington, D.C.: March 1977, p. 69.

[a] Rural/Urban breakdown is based on splitting the yearly or one-time tax components between these roads in proportion to the distribution of vehicle-miles of travel by the particular class on these roads.

APPENDIX TABLE 62. Key transportation issues, 1978.

1. Federal Economic Regulatory Reform
2. Air Carrier Regulation
3. Motor Carrier Entry
4. Rail Abandonment
5. Standard Highway Rules and Regulations
6. Public versus Private Ownership of Transportation
7. Proliferation of Government Agencies
8. Consolidation of Transportation Regulatory Agencies
9. Federal Transportation Planning Assistance
10. Federal Subsidies
11. Modal-Intermodal Trust Funds
12. Block Grants to State and Local Governments
13. Maritime Trades Support
14. Waterway User Charges
15. Financing Urban Mass Transportation
16. Maintenance, Repair, and Upgrading of Highway Facilities
17. Transportation Industry Capital Formation
18. Coal Slurry Pipelines
19. Energy Conservation
20. Transportation and the Environment
21. Highway Accident Reduction
22. Labor-Management Relations
23. Stimulation of Employment through Transportation Facility Construction
24. Regional and Community Development through Transportation Policy
25. Mobility Rights

SOURCE: National Transportation Policy Study Commission, *Current Transportation Issues in the United States, Volume 1: Executive Summary*, Special Report No. NTPSC/SR–78/01A, Washington, D.C.: 1978, pp. 7–81.

Appendix I
Policy Definitions

INTRODUCTION

In defining policy, one immediately is drawn into a broader context of goals, objectives, programs, impacts, issues, gaps, conflicts, and perspectives. Each of these terms is defined below and used to order perceptions of the U.S. transportation system. These definitions are presented in the hope of reducing the confusion that can arise when policy terms are not used consistently by persons participating in the policymaking process. For example, what is defined below as a goal is sometimes called a policy in the U.S. Code. Similarly, a policy is sometimes labeled a program in the Code of Federal Regulations. One sentence of a statement by a Federal official may contain goals, policies, and programs, so that the same sentence (or parts of it) could be classified in several ways. Perhaps this explains why no complete compendium of Federal transportation goals, objectives, policies, and programs has existed. Whatever references there are tend to focus narrowly on one transport mode; by contrast, the approach of the NTPSC was to consider all modes in the context of intercity, urban, rural and international markets, so as to highlight systemwide effects.

SUMMARY

Policy is a guide for choice. When the choice to be made is simple or noncontroversial, the policy, or method of choosing, may itself generate little controversy. On the other hand, the policy will generate intense interest when the choice is difficult, the person doing the choosing is controversial, or the persons affected by the choice have much at stake. Where such debate about policy occurs, it is called a *policy issue*.

Because any particular guide for choice may yield decisions that appeal to some people and displease others, a particular policy may be an issue to one group and seem trivial to another. For this reason, the *perspective*, or point of view, of persons debating a policy issue should be specified.

A *goal* is a desired end. In deciding how to act, or which particular action from a set of possible actions to undertake, the desired outcome of the action is often considered. A policy would set forth a method for choosing how to act to accomplish, or strive toward, a goal. A policy sets forth criteria with which to rule out some potential actions as being undesirable and, instead, focuses attention on other potential actions as being more conducive to movement toward the desired end.

Often more than one desirable end is apparent. In some cases, achieving one of these would rule out achieving the others. In such a situation, policy provides a mechanism for choosing which goal to pursue from a competing set of goals.

When a specific, measurable statement of the desired end is given, it is called an *objective*.

While policy sets forth a method for choosing between competing ways to pursue goals, the choices, or decisions, that are made are *programs*. A program is a set of actions.

Actions, in turn, generate results, or *impacts*. An impact also depends on one's perspective. What one person believes to be the results of an action, another person may disbelieve. One person may believe the consequences of an action to be more or less important than would another person. Where these perceptions differ, an *issue* exists.

In some cases, policies or programs may overlap, and where they do, competing directions may be given. This is labeled a *conflict*. In other cases, policies or programs may be applied inconsistently so that seemingly similar activities are not subject to similar policies or programs. Where this occurs, it is labeled a *gap*.

GOALS

Expressions of goals, being quite general, are easy to make. It follows that goals often are stated in legislation, administrative rules, speeches, and interviews without much attention being given to their compatibility. Goals are also confusingly labeled "purposes," "objectives," or "policies." But goals are defined here as "desired ends," regardless of what they are labeled by those making statements.

Expressions of desired ends for the country, for the transportation system as a whole, and for individual modes appear in numerous sources. The principle source of goals for the country is the U.S. Constitution. Individual rights are foremost among the goals listed there. Other national goals often expressed are those of economic stability, growth and development, equitable opportunity, national defense, and (more recently) energy conservation and development and environmental protection and enhancement.

Transportation system goals often are identical to other U.S. goals, as transportation is regarded as a means to achieve these other ends. However, the nation also seeks to achieve desirable consequences for the transportation system itself. Eleven categories that seem to be fundamental for classifying transportation goals are shown in Table 107.

Where goals are expressed for transportation, they rarely address the entire system. A few examples do exist, however. A broad statement of national transportation goals was set forth by the Transportation Act of 1940, which mentions such goals as *efficient* transportation and *industry promotion* (e.g., "promote adequate, economical and efficient service . . . and recognition and preservation of the inherent advantages of each mode, . . . sound economic conditions in transportation . . ."); *equitable* transportation and *appropriate rates and prices* (e.g., "impartial regulation . . . establishment and maintenance of reasonable charges, without unjust discriminations . . ."); *employment* (e.g., ". . . equitable working conditions . . ."); and *adequate transportation service, defense,* and *safety* (e.g., "all to the end of developing, coordinating and preserving a national transportation system . . . adequate to meet the needs of commerce . . . the Postal Service, and . . . national defense," and "promote safe, . . . adequate . . . transportation . . .").[1]

Another statement of national transportation goals was enunciated by the Congress on October 15, 1966, with the passage of the U.S. Department of Transportation Act. In this Act, Congress declared:

> . . . that the general welfare, the economic growth and stability of the nation and its security require the development of national transportation policies and programs conducive to the provision of fast, safe, efficient, and convenient transportation at the lowest cost consistent therewith and with other national objectives, including the efficient utilization and conservation of the nation's resources.[2]

In spite of these broad general statements, there is no unified set of transportation goals with related objectives and priorities that enables Congress, the executive branch, DOT and regulatory agencies to coordinate transport programs and policies and to make tradeoffs. Instead, there are many modal programs administered by modal administrations, espousing modal policies seeking to accomplish modal goals. Several examples of transportation goals expressed for individual modes rather than for the system as a whole are given in Table I–1.

OBJECTIVES

Objectives are defined here as "specific statements of desired ends." In other words, objectives and goals are roughly synonymous, with objectives falling toward the measurable edge and goals toward the unmeasurable edge of the spectrum of desired ends. But in trying to provide an inventory of objectives, the cupboard proved virtually bare. Some of the few examples that could be found are shown in Table I–2.

One implication of this paucity of specific statements of desired ends is the obvious difficulty in measuring attainment of desired ends, so that policies and programs cannot easily be evaluated. The lack of objectives and the plethora of goals are probably not accidental. It is easier to express general rather than specific targets. It is easier to rationalize failure to accomplish a fuzzy rather than a precise target. It is easier to escape accountability for actions that have adverse consequences when no specific target is known. In sum, it is easy *not* to express objectives.

One view of the U.S. political process is that Congress is concerned with establishing broad goals for the U.S. transportation system, while the executive branch is concerned with narrowing the focus sufficiently to constitute meaningful objectives. The NTPSC's investigations have shown that such is not the case. Although Congress does express itself in terms of broad goals, the executive branch does not then proceed to define objectives. Instead, it skips to the program level and concerns itself with the details of actions to achieve congressional goals. Thus, administrative rules (contained in the Code of Federal Regulations, for example) may be specific, quantified, and exact, but they are concerned with how to carry out an action, not with what is expected to be accomplished. Such rules are program statements, or sometimes aspects of policy, but *not* objectives.

It does seem vitally important to an effective U.S. transportation system that objectives be stated. For example, it is hard to imagine exactly what is meant by "achieving" a goal, when the goal has not been stated in a fashion that permits measurement. Because multiple goals are frequently proposed for particular transport policies or programs, the need seems obvious to state these goals in a quantitative form so that progress may be charted and benefits compared to costs.

However, it is clear that in some isolated cases, where transportation objectives have been stated, undesirable consequences have arisen. For example, Congress, in initiating the U.S. Interstate Highway System in 1956, did specify the length of system desired, the design year, the design standards, and the desired completion date. All of these program details and policy decisions were given to improve highway service and provide for the U.S. defense in a way that some might consider to be at least a clear statement of congressional intent, if not exactly an objective. One consequence of Congress' emphatic

TABLE I–1. Examples of modal goals

Goal	Mode	Example	Source
Adequate Service	Air	Improve airport service to meet needs of commerce.	49 USC Section 1701
Appropriate Rates & Prices	Rail	Eliminate unjust, unreasonable, discriminatory and unduly preferential rates.	49 USC Section 10701
Safety	Pipeline	Promote safety in transport of gases and hazardous liquids.	49 CFR Section 1
Efficiency	Water	Promote efficiency of waterborne commerce.	33 USC Section 551
Equity	Transit	Improve access of elderly and handicapped persons	49 USC Section 1612(a)
Industry Promotion & Protection	Air	Promote and encourage civil aeronautics.	49 USC Section 1302
Employment	Transit	Protect rights of private transit employees involved in public takeovers.	49 USC Section 1609
Regional & Urban Development	Highway	Facilitate growth in economically depressed areas.	23 USC Section 143(a)
Environmental Protection & Enhancement	Water	Protect wildlife when improving navigation on rivers.	33 USC Section 540
Energy Conservation & Development	Highway	Conserve fuel by reduced speeds.	23 CFR Section 658.1
Defense	Rail	Help railroads so as to insure a strong national defense.	49 USC Section 1231

TABLE I–2. Examples of modal objectives

Goals/Modes	Objective	Source
ADEQUATE SERVICE Railroad	Establish intercity rail passenger service with trip times (including intermediate station stops) of 3 hours 40 minutes between Boston and New York and 2 hours 40 minutes between New York and Washington by 1981.	4–R Act, Pub. L. 94–210, Section 703, Feb. 5, 1976
SAFETY Highway	(Proposed): To reduce the fatality rate by more than 40 percent and to save 20,000 lives by 1990 using preventive measures.	*National Transportation Trends and Choices,* p. 108[3]
ENVIRONMENTAL PROTECTION AND ENHANCEMENT Highway (Trucks and Buses)	To reduce hydrocarbon and carbon monoxide emissions by 90 percent from 1970 to 1983 and nitrogen oxide emissions by 75 percent from 1970 to 1985.	Pub. L. 95–95, Section 202(g), (3)A(ii)
ENVIRONMENTAL PROTECTION AND ENHANCEMENT Highway (Auto)	To reduce hydrocarbon emissions by 90 percent from 1970 to 1980 and carbon monoxide emission by 90 percent from 1970 to 1981.	Pub. L. 95–95, Section 202(b)(1)A, B
ENERGY CONSERVATION AND DEVELOPMENT All	To reduce petroleum consumption by 10 percent from the 1977 level by 1985, and oil imports by 6 million gallons/day by 1985.	National Energy Act, Pub. L. 95–617

statement of its desires may have been that urban governments were discouraged from considering fully the adverse social and environmental consequences of the Interstate System to certain neighborhoods. The point is that providing objectives, although this may often facilitate effective pursuit of goals, is not likely to be a panacea. It remains startling, however, that so few explicit statements of transportation objectives exist.

POLICIES

Policies are similar to goals in that they tend to lack concreteness. (Objectives, whenever expressed, seem to share with programs the properties of being precise and easily understood.) Policies, defined here as "guides for choice," are necessary to select among competing actions (programs) or among possible purposes (goals). It is easy to see that goals often conflict, and policymaking often seeks to solve the problem of wanting too many good things by weighting the competing goals.

Chapter 2 contains a complete discussion of U.S. transportation policies, so that only a few examples are highlighted here to suggest several attributes of "good policies." These favorable qualities tend to transform policies from general, unmeasurable concepts similar to goals into more precise, measurable concepts similar to objectives and programs.

What must policy contain to guide program formation effectively? The following list of characteristics, with hypothetical examples, provides a partial answer:

1. Association with clear objectives which would be reasonably attainable, with short-term and long-term elements.
   Example: The DOT shall employ members of minorities to fill 20 percent of all staff vacancies until 12 percent of all employees (professional and clerical) are minority persons. Thereafter, the 12 percent level of minority employment shall be maintained, as a minimum.
2. Specification of constraints (e.g., resources and time) and bounds on tools to be used or not used.
   Example: No more than 7 percent of the total funds shall be distributed to any one state.
   Example: The agency must promulgate regulations within 60 days after enactment.
3. Embodiment of sensitivity to changing conditions.
   Example: An additional $100 million shall be available to carry out this act, for each 1/4 of 1 percent unemployment nationwide above 6 percent.

Note that the policies used as examples may not be policies which everyone likes or which everyone would wish to recommend, despite possessing desirable characteristics. At least policies expressed in this manner permit reasoned discussion of their consequences and facilitate informed judgment.

PROGRAMS

Programs, being "sets of actions," are readily observable. Funds being spent, regulations being enforced, and taxes being collected seem to be relatively straightforward concepts. In addition to the extensive collection of programs listed in Chapter 2 and the NTPSC's Special Report No. 6,[4] other sources provide inventories of transportation programs. For example, OMB's *Catalog of Federal Domestic Assistance*[5] and the Community Services Administration's *Annual Federal Outlays in Summary*[6] have detailed descriptions of all programs (including transportation) that involve Federal grants or spending. DOT publishes annual budget reports that detail its programs, such as *Analysis of FY '77 DOT Program by Policy and RD&D Management Objectives.*[7] Special studies often list transportation programs for a particular mode or area of interest, such as GAO's 1977 report titled *Hindrances to Coordinating Transportation of People Participating in Federally Funded Grant Programs*[8] with 114 such programs.

Therefore, there is no lack of lists of programs. Most lists, however, have treated individual modes, issues, or agencies, in contrast to the method used in Chapter 2.

IMPACTS

Impacts are the results of policy choices and program actions. There appear to be no studies that treat impacts systematically for the entire transportation system. Rather, these existing studies seem to examine selected programs, modes, or at best markets.

This study, as detailed in Chapter 14, chose to report impacts according to the eleven goals listed in Table 107. Wherever possible, impacts were provided for *all* eleven goals, even if only one goal seems to be the primary target for a particular policy or program. This is because secondary impacts may turn out to be important to the overall impact of the policy or program. For example, the 55 mile-per-hour speed limit was imposed primarily to conserve energy. Although most agree that it has had such an impact, it may also have saved lives. Both impacts, as well as any negative impacts concerning travel time and enforcement, are important in determining the effectiveness of the action.

In addition, an attempt has been made to report impacts according to region, groups which are net gainers or losers, and time (short versus long-run). Issue-specific, market, and national impacts are given. In this report, rather than simply asserting policies, proposals of policies together with projected impacts are based on evaluation of quantitative evidence wherever possible. Where impact evidence does not exist, informed judgment (clearly labeled as such) is exercised.

ISSUES

Issues, or differences of opinion, arise in a number of ways and vary in their severity (or difficulty of resolution). Some issues are so fundamental that the parties to the dispute may never agree to a mutually acceptable solution or compromise, nor would they accept a solution imposed by a third party. Other issues may be temporary or based on misunderstandings that can be cleared up with reasoned discussion or additional evidence. Policy itself should specify which issues to address, based on an evaluation of impacts.

The NTPSC identified issues in several ways (e.g., surveys, public hearings, searches of published research, examination of existing policies and programs, plus forecasting and scenario development). These issues are summarized in Chapter 12. In addition, NTPSC Special Report No. 1 provides a thorough discussion of 25 key transportation issues.[9]

CONCLUSIONS

Consideration of these definitions and examples illustrates the difficulties inherent in classification. A policy expressed in the statutes may be different than an administrator's conception of the same policy. The courts may interpret the same statutory language in still a different way. A policy expressed by a decisionmaker may reflect the way an agency actually performs or the way he or she would like it to perform. A statement labeled "policy" may be instead a delineation of goals. Although the concept of "objectives" seems useful (being a specific statement of desired ends and hence more easily measured than a more abstract goal), in practice examples are embarrassingly hard to discover.

Even the same word, in varying contexts, may be either a goal, objective, policy, or program. Take "energy" for example. A proposal to save it is a goal. A proposal to save one million barrels per day of oil is an objective. A proposal to allow the market to allocate energy is a policy (although others would call this a goal). And if fuel economy standards for motor vehicles are set, those standards are a program (although some would call this a policy or an objective).

Arguments about Federal policy issues also can take several forms. For example, if elderly and handicapped persons wish to change Federal efforts related to their transportation, the issue may be one of goals (e.g., equity, adequate service, and efficiency), one of policy (e.g., Transbus, retrofit or special efforts), or one of programs (such as UMTA's Section 16(b)2[10] and HEW's Older Americans Act, Title III and VII[11]). The point is that very careful attention must be given to expressing concepts in a consistent vocabulary, so that both problems and solutions can be uniformly perceived.

One can examine lists of goals and ask, "Are U.S. goals reasonable and complete?" That is, are the stated goals in fact desirable ends, and are any worthwhile ends being ignored? The goals gleaned from a wide variety of sources do appear to be reasonable and complete. As new desirable ends become apparent, they are added (e.g., energy conservation and development).

Another level from which goals can be viewed is to look at individual policies or programs and ask, "To what extent are the desired ends of any particular policy or program reasonable?" Again, no real problems seem apparent. Most stated reasons for a policy or program can be expressed in terms of one or more goals that are widely supported.

Therefore, at both of these levels goals themselves appear to be complete and reasonable. Problems do become apparent when examining methods proposed to achieve goals (policies and programs) and when trying to measure the success or failure of these methods (due to a lack of *objectives*).

Several problems with the existing goal-setting process were identified, despite the fact that the goals themselves appeared to be reasonable and complete:

1. Goals are more well-defined for separate transportation modes than for the U.S. transportation system.
2. Objectives are virtually non-existent.
3. There appear to be no uniform methods for incorporating opinions held by various levels of government and interest groups into the development of transportation goals and objectives.
4. Because objectives are not clearly stated, it is unclear how government efforts to "evaluate" policies and programs can be effective or how policymakers and program administrators can be held accountable for their performance.

Thus, the conclusion is not that *new* goals are needed, but that a new goal-setting process is required. Specifically, each policy or program should be undertaken in conformance with an explicitly stated *objective*. The action of stating these objectives should encourage debate by a variety of participants, as well as coordination, measurement, evaluation, and accountability.

NOTES AND REFERENCES

1. Transportation Act of 1940, 49 U.S.C. Section 10101 (1978), 54 Stat. 899.
2. 49 U.S.C. Section 1651(a) (1976).
3. U.S. Department of Transportation, Office of the Secretary, *National Transportation—Trends and Choices (to the Year 2000)*, Washington, D.C.: Government Printing Office, 1977.
4. U.S. National Transportation Policy Study Commission, *A Compendium of Federal Transportation Policies and Programs*, Report No. NTPSC/SR–78/06, Washington, D.C.: 1979. (Available through the National Technical Information Service.)
5. The latest is U.S. Office of Management and Budget, *1977 Catalog of Federal Domestic Assistance*, Washington, D.C.: Government Printing Office, 1977.
6. U.S. Community Services Administration, *Federal Outlays in Summary, Fiscal Year 1976*, Washington, D.C.: 1977.
7. U.S. Department of Transportation, Office of the Secretary, *Analysis of Fiscal Year 1977 DOT Program by Policy and RD&D Management Objectives*, 2 volumes, Washington, D.C.: 1976.
8. U.S. General Accounting Office, Office of the Comptroller General, *Hindrances to Coordinating Transportation of People Participating in Federally Funded Grant Programs*, 2 volumes, Washington, D.C.: 1977.
9. U.S. National Transportation Policy Study Commission, *Current Transportation Issues in the United States*, 2 volumes, NTPSC Special Report No. 1, Washington, D.C.: 1978.
10. 49 U.S.C. Section 1612.
11. Older Americans Act, 42 U.S.C. Section 3001 *et seq (1978);* Pub. L. 89–73.

Appendix II
Comparative Social, Economic and Transportation Forecasts

SOCIAL AND ECONOMIC PROJECTIONS

As a check on the consistency of the NTPSC's social and economic assumptions, a review of other projections was performed. Comparisons were made for most of the parameters of the NTPSC scenarios with the following sources—Wharton, Chase Econometrics, Data Resource Inc. (DRI), the National Planning Association, and the Inforum model of the University of Maryland. Most of these are formal, structural, long-term economic forecasting models, unlike the NTPSC's scenario method. For those sources that did not forecast over the complete 1975 to 2005 period, the projections were "straight-lined" to the year 2005 from their own last projection year.

A few examples of these comparisons are shown in the accompanying graphs. By comparing both the absolute numbers and average annual growth rates for NTPSC's GNP assumptions, it was found that the NTPSC numbers were either within the range of numbers produced by others, or spanned a "reasonable" bracket around them. (See Figure II–1.) Indeed, had the other sources projected GNP to the year 2005, their forecasts in many cases would have been identical to the NTPSC's.

An example is government spending as a percent of GNP. When disaggregated into Federal, state, and local components, it appears that NTPSC's assumptions of state and local expenditures as a percentage of GNP align fairly closely with those of other sources. However, there is an inconsistency in Federal expenditures assumptions. (See Figure II–2.) Most other sources predict a constant growth in this parameter, while Wharton predicts a slight decline through 2000. Wharton operates under an assumption of a balanced budget with significantly reduced Federal debt and interest payments. Wharton also assumes no increase in Federal transfer payments over the period. The reason for choosing to disagree with these assumptions is that NTPSC has assumed the status quo will continue as regards these policies (i.e., continued growth in welfare and Social Security payments) over the period of interest.

TRANSPORTATION PROJECTIONS

The market-by-market forecasts of transportation activity made by the NTPSC were likewise compared with projections of other groups and organizations.

The *Transportation Energy Conservation Data Book* published by Oak Ridge National Laboratory contains a section on projections displaying a number of transportation forecasts. NTPSC estimates have been added to these graphs for comparison. In some cases the projections were not similar due to differences in definitions. In other cases, although the definitions were not precisely identical, side-by-side examinations were useful and hence are shown.

Total transportation energy consumption, shown in Figure II–4, exhibits noticeable differences between NTPSC estimates and others. However, while the other forecasts include all transportation energy consumption, NTPSC includes only non-military, non-government use.

Figure II–9 shows NTPSC estimates of the total U.S. auto fleet to be higher than all other forecasts by 2000. However, the NTPSC included small trucks and vans used for passenger travel in its total. The others included only autos. The same reasoning applies to Figure II–10, where NTPSC auto VMT is higher than other forecasts.

SOURCES

Sources for the Projections in Figures II–4 through II–13[a].

1. TEC—estimates by the Data Analysis Branch of the Transportation Energy Conservation (TEC) Division, U.S. Energy Research and Development Administration (ERDA).
2. TECNET—simulation runs during 1977 on the TECNET model built by International Research and Technology, Inc., for the Data Analysis Branch, TEC, ERDA. Documentation is contained in a three volume report, *The Transportation Energy Conservation Network*.
3. SRI—based on Stanford Research Institute, *Transportation in America's Future: Potentials for the Next Half Century,* prepared for U.S. Department of Transportation, Report No. DOT–TPI–20–77–21, Palo Alto, California: June 1977.

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[a] Adapted from Oak Ridge National Laboratory, *Transportation Energy Conservation Data Book: Edition 2,* prepared for U.S. Energy Research and Development Administration, Report No. ORNL–5320, Oak Ridge, Tennessee: 1977, pp. 225–253.

This report describes four alternative socio-economic futures for the U.S. and their implications for transportation through 2025. The futures—designated Success, Foul Weather, Disciplined Society and Transformation—vary particularly along the dimensions of economic performance, climate, institutional structure, and personal values. For each future, a detailed narrative account is provided, accompanied by separate analyses of the energy, demographic, economic, and urban implications of each scenario; selected events outside the scenarios; technology forecasts for 12 transportation modes and for 7 specific technologies; transportation demand; and 6 critical transportation problems. Some additions to the numbers in this report were provided by Tom Mandel of SRI in a letter to Philip Patterson dated August 8, 1977.

4. CONAES—from Jeffrey Lyle Staley, *A Transportation Energy Use Forecasting Model,* West Lafayette, Indiana: Purdue University, August 1977. CONAES stands for the Committee on Nuclear and Alternative Energy Systems. The study was financed by ERDA and conducted under the guidance of the National Academy of Sciences. This thesis documents the model and five of the scenarios developed by the Transportation Resources Group of CONAES. The model projects future energy demand for five passenger and four freight transportation modes. Essentially an accounting model, it provides a framework upon which to build more detailed relationships between the national economy and the various transportation modes.
5. JFA—Jack Faucett Associates, *Transportation Projections, 1985, 1995, 2000,* prepared for DOT, Draft Report No. JACKFAU–77–152, Washington, D.C.: June 15, 1977. This study projects transportation activity and energy use for 31 for-hire and private modes of transport. The projections reflect three alternative rates of general economic growth. The Inforum input-output model was used to calculate most of the freight demands, and separate special analyses were made for the bulk commodities of coal, crude oil, fuel oil, other petroleum products and grain. Passenger projections relied on the use of an auto model developed by JFA for FEA and on detailed analyses in each of the other passenger modes.
6. MOPPS II—U.S. Energy Research and Development Administration, *The Marketing Oriented Program Planning Study,* Phase II, Draft Report, Washington, D.C.: June 1977.
7. T&C—U.S. Department of Transportation, Office of the Secretary, *National Transportation: Trends and Choices (to the Year 2000),* Washington, D.C.: January 1977.
8. FORD—Ford Energy Policy Project, *A Time to Choose,* Cambridge, Massachusetts: Ballinger Publishing Co., 1974.
9. ERDA–48—U.S. Energy Research and Development Administration, *A National Plan for Energy Research and Development Administration,* Vol. 1, Washington, D.C.: 1975.
10. WHARTON—Wharton EFA, Inc., *An Analysis of the Automobile Market: Modeling the Long-Run Determinants of the Demand for Automobiles,* Vol. 1, prepared for U.S. Department of Transportation, Washington, D.C.: February 1977.
11. FAA—U.S. Federal Aviation Administration, *Aviation Futures to the Year 2000,* Washington, D.C.: February 1977.

FIGURE II–1. Gross National Product comparisons.

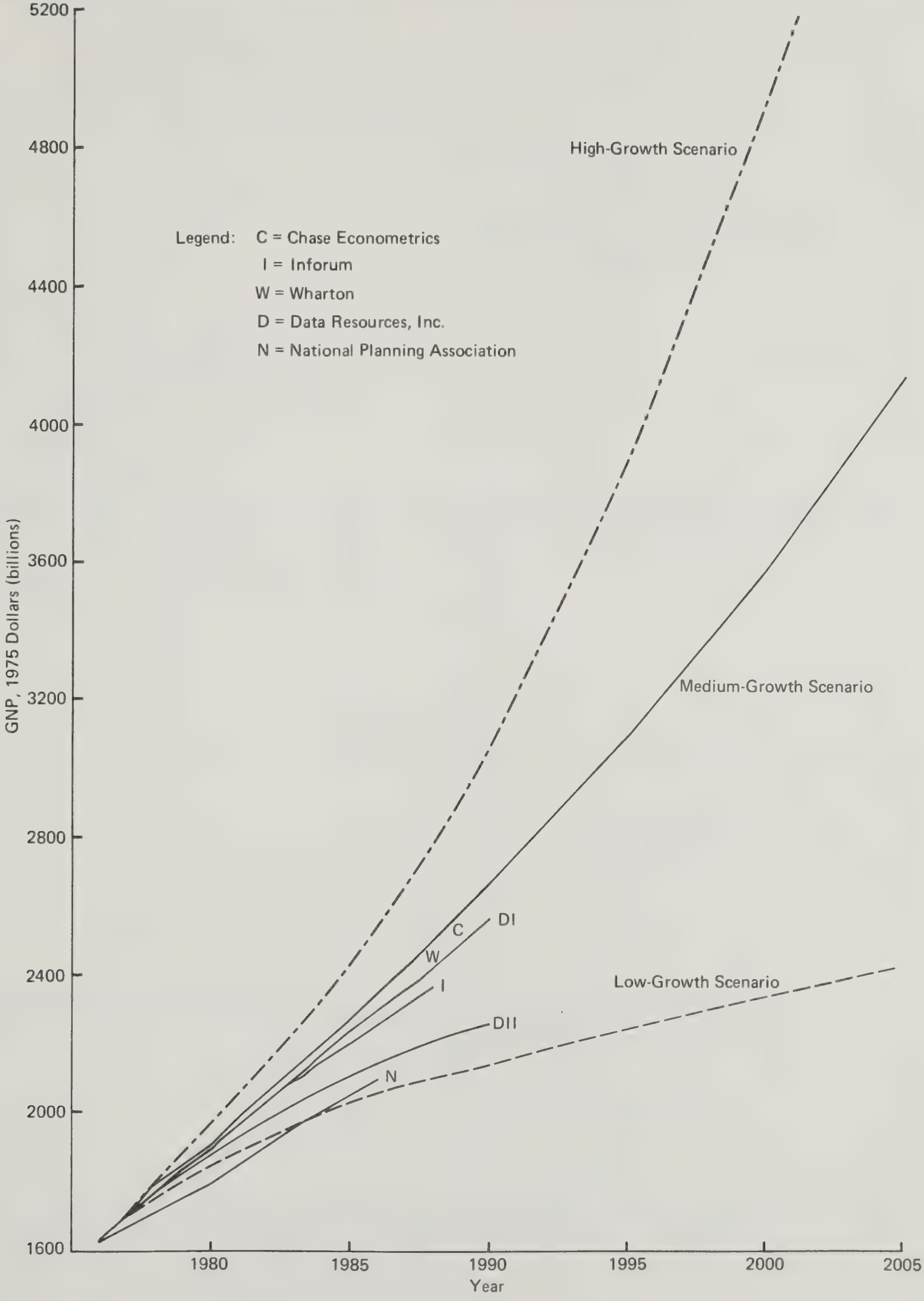


FIGURE II–2. **Federal government spending as a percentage of GNP.**

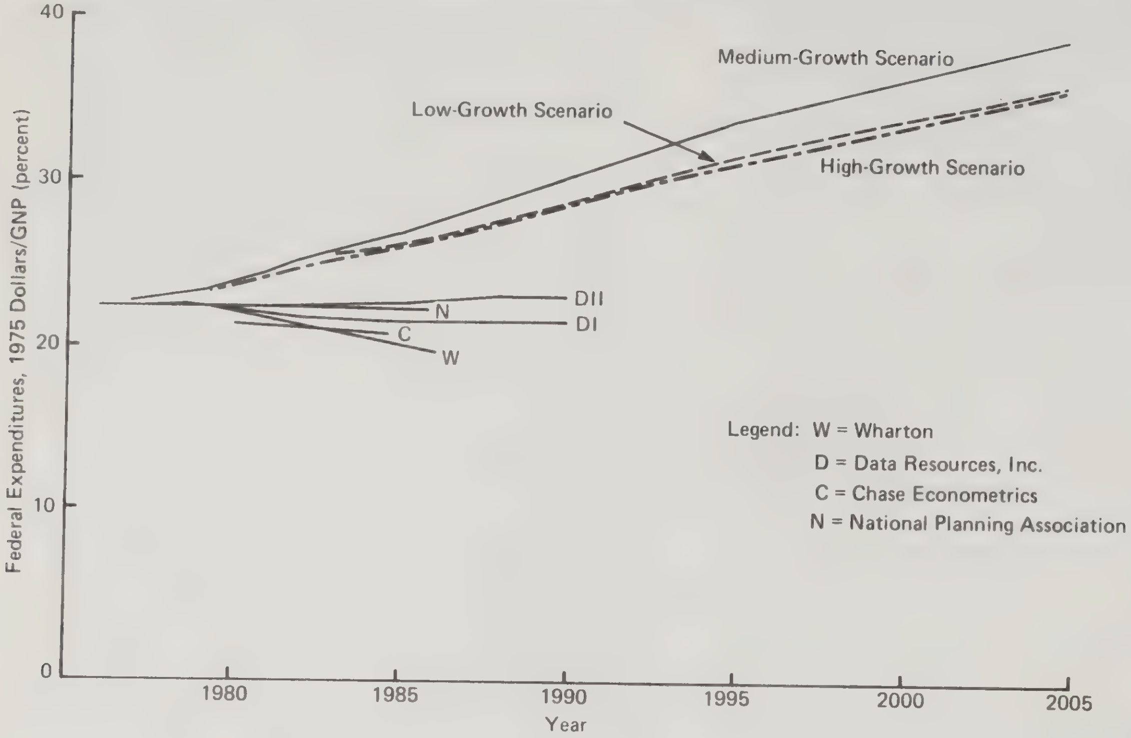
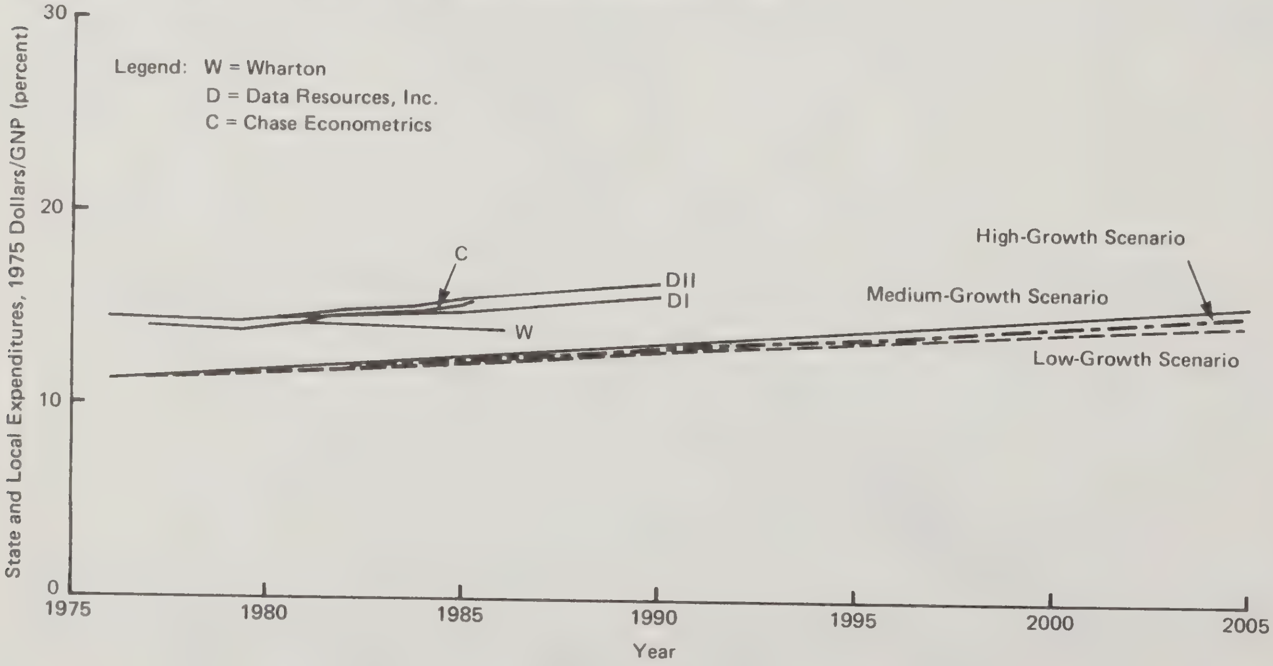
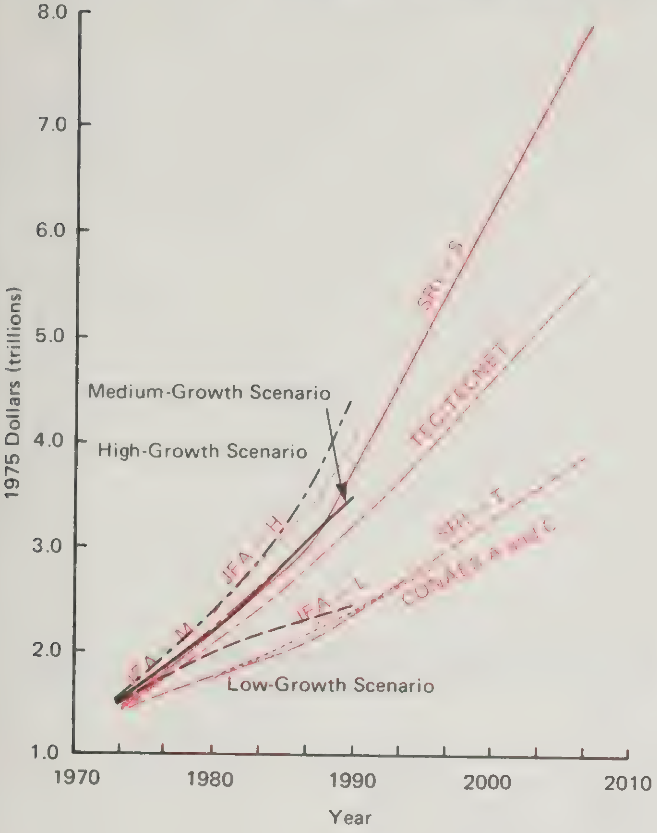


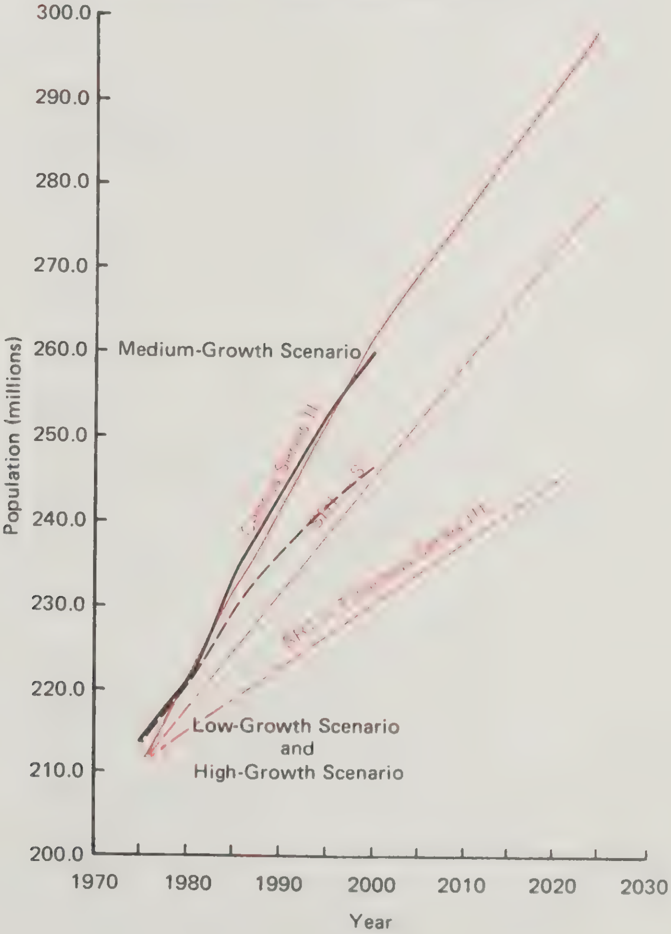
FIGURE II–3. **State and local government spending as a percentage of GNP.**



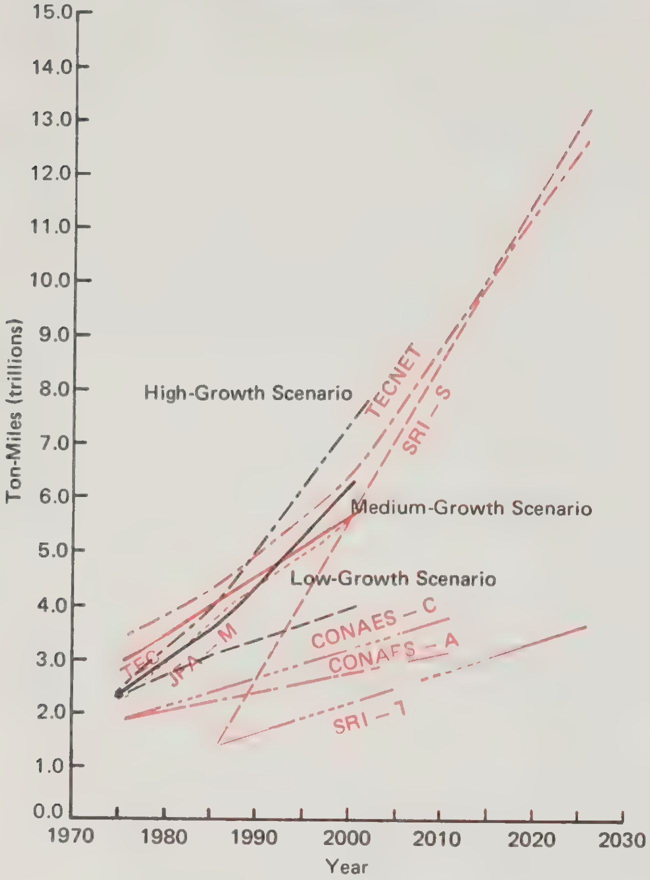
APPENDIX FIGURE II–4. Comparison of Gross National Product projections, 1975 to 2025.



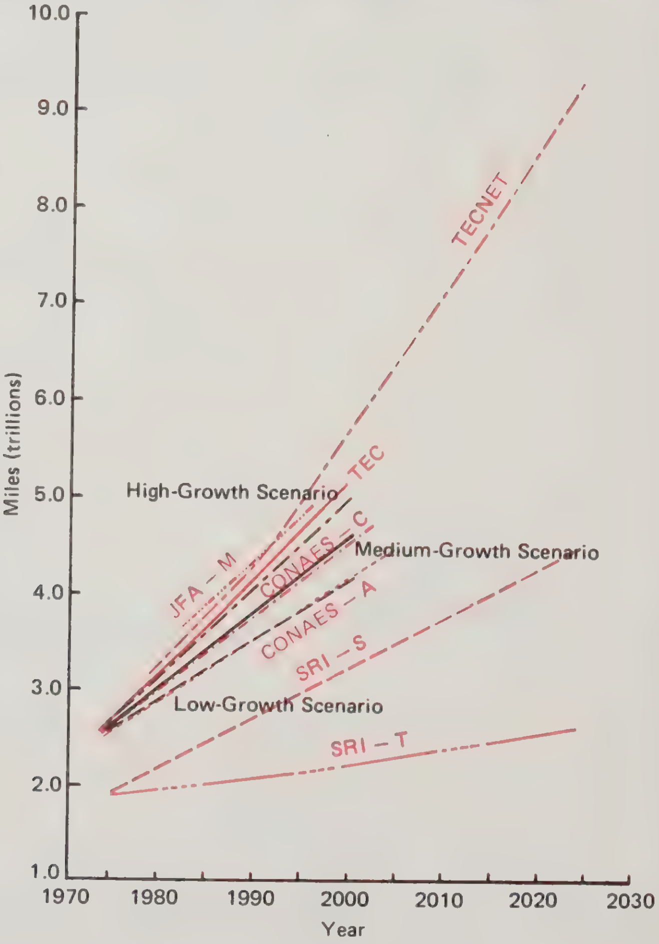
APPENDIX FIGURE II–5. Comparison of population projections, 1975 to 2025.



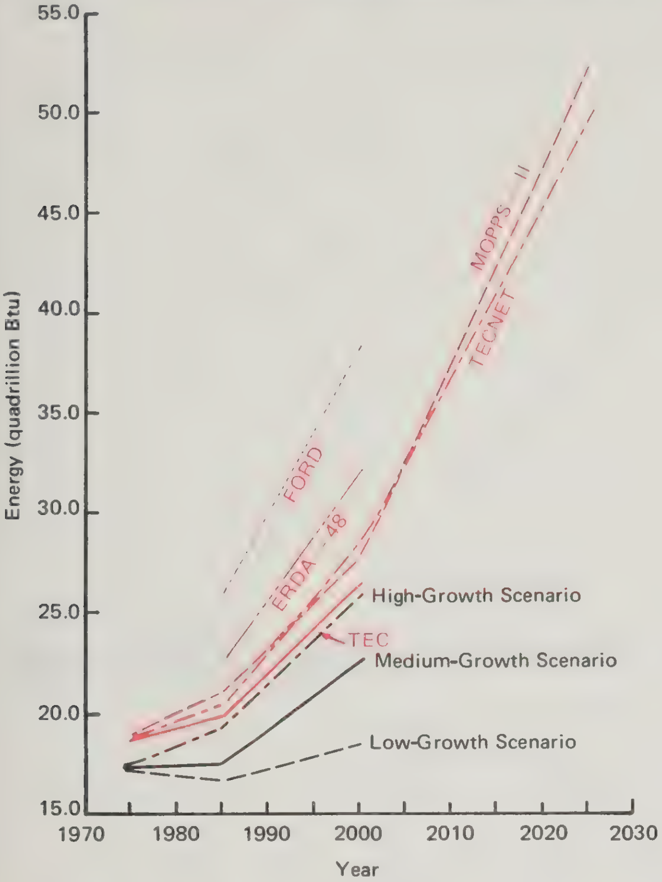
APPENDIX FIGURE II–6. **Comparison of projected ton-miles, 1975 to 2025.**



APPENDIX FIGURE II–7. **Comparison of projected passenger-miles of travel, 1975 to 2025.**

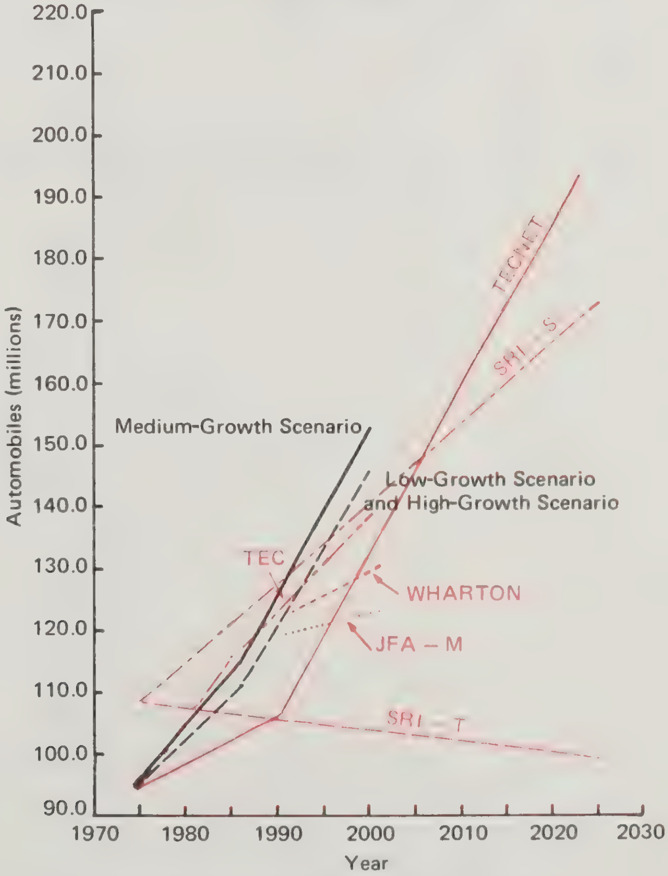


APPENDIX FIGURE II–8. **Comparison of projected transportation energy demand,[a] 1979 to 2025.**



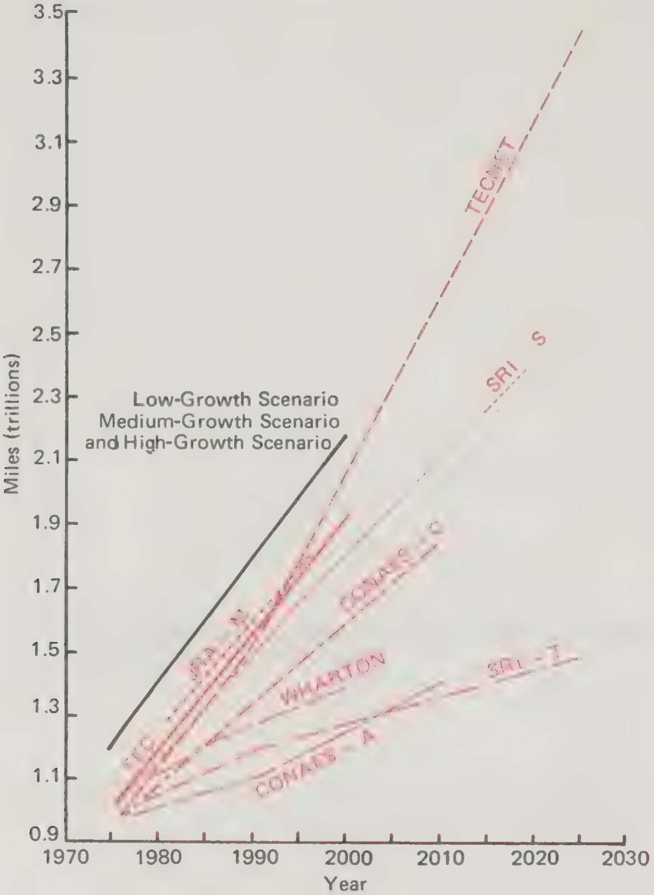
[a]NTPSC forecast includes only non-military, non-government, domestic transportation.

APPENDIX FIGURE II–9. **Comparison of projected number of automobiles in U.S. fleet,[a] 1975 to 2025.**



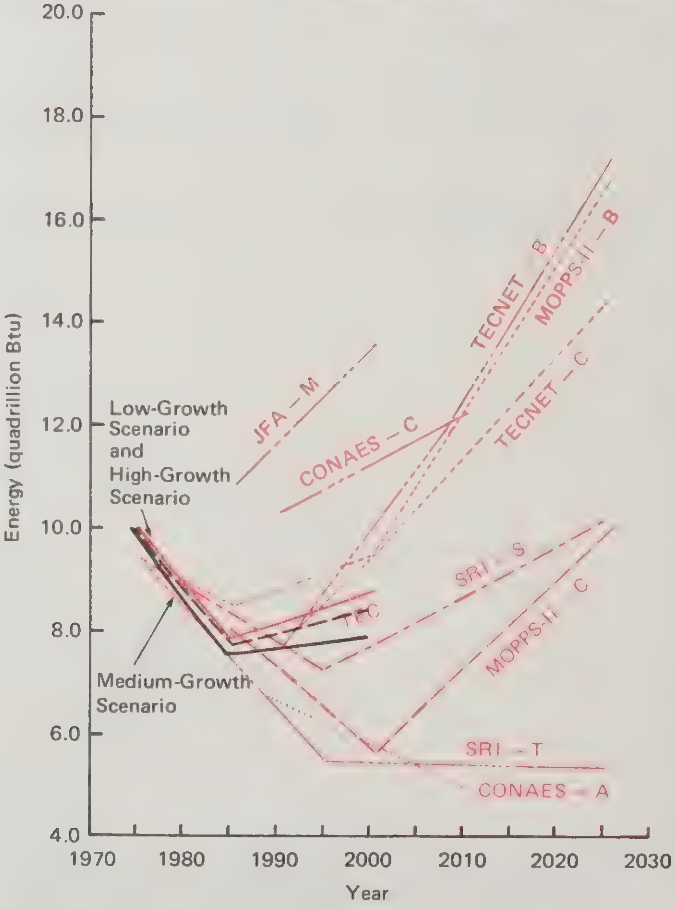
[a]NTPSC includes small trucks and vans for personal travel.

APPENDIX FIGURE II–10. **Comparison of projected vehicle-miles of automobile travel,[a] 1975 to 2025.**



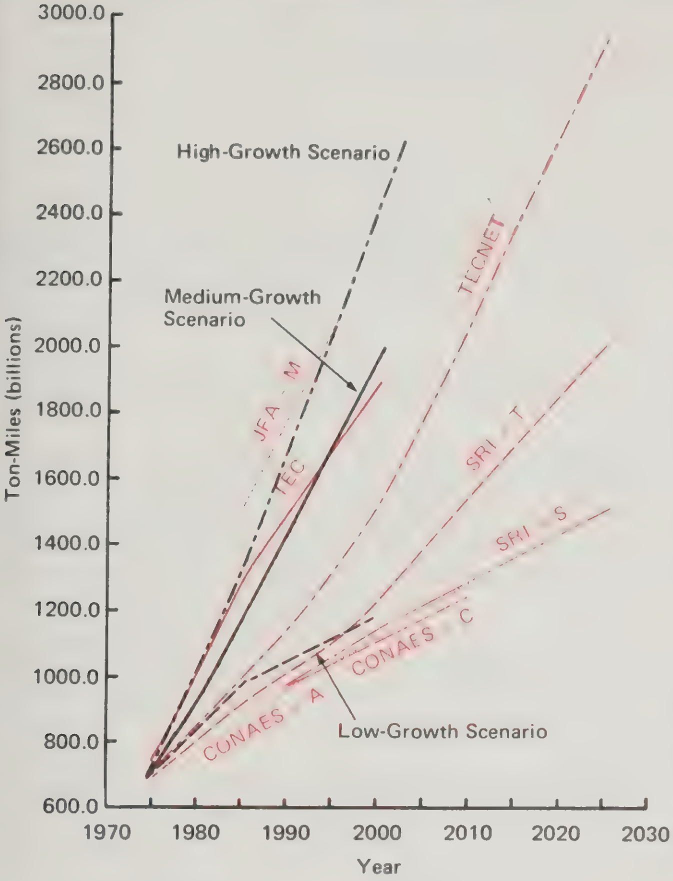
[a]NTPSC includes small trucks and vans for personal travel.

APPENDIX FIGURE II–11. **Comparison of projected automobile energy demand,[a] 1975 to 2025.**

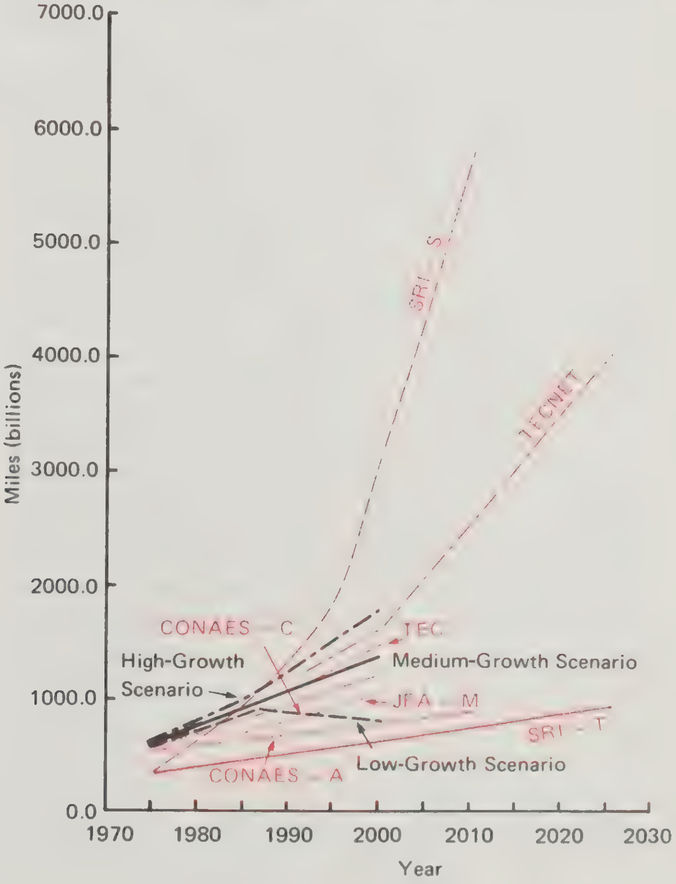


[a]NTPSC projections did not include small trucks and vans.

APPENDIX FIGURE II–12. **Comparison of projected rail ton-miles, 1975 to 2025.**



APPENDIX FIGURE II–13. **Comparison of projected truck ton-miles, 1975 to 2025.**



Appendix III
Alternative Energy Sources and Coal Movement Projections

This appendix contains supplementary material to Chapter 8 regarding the development of alternative energy sources, including illustrations of the potential movements of energy.

PRODUCTION OF ALTERNATIVE ENERGIES

In order to change the U.S. economy from reliance on petroleum fuels to other energies, several barriers must be overcome. Chief among these are: the establishment of energy supply technologies in large-scale production; obtaining significant amounts of capital; and overcoming long lead times.

Appendix Figure III–1 diagrams the possible processes and flows to bring the raw materials' energy value to the end user. Appendix Figure III–2 indicates the lead times involved for various alternative energy technologies.

The following data suggest the investments needed for the year 2000 (in 1975 dollars) for the forecast of synthetic liquids used in Chapter 8.

Synthoil from coal:	$75 to $85 billion
Oil from shale:	$ 4 to $ 6 billion
Synthetic gas:	$18 to $21 billion

This massive capital investment will not be the sole determinant of the cost of these fuels (and hence their competitiveness); the price of coal will also be a determinant. If coal prices rise as rapidly or faster than oil, this will restrain development. Conversion costs could well be higher than estimated, which will make development less attractive. Coal conversion cost estimates have varied by a factor of 200 percent during the past few years.[1]

POTENTIAL USE OF ALTERNATIVE FUELS BY TRANSPORTATION

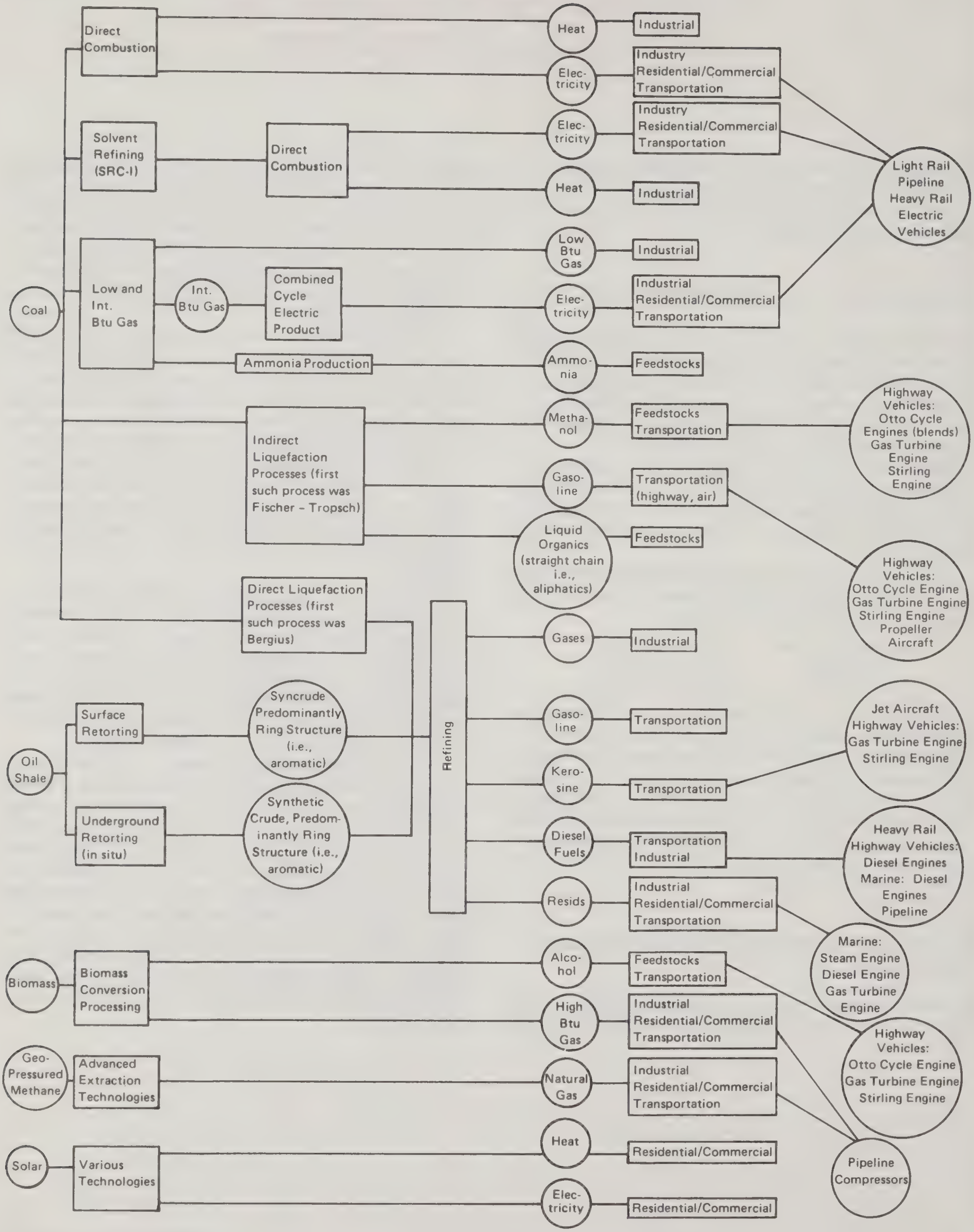
Synthetic fuels from coal or oil shale appear to be preferable to straight alcohol as an alternative transportation fuel. Synfuels are advantageous because they are chemically similar to petroleum fuels and thus compatible with both the existing distribution system and current vehicle types. Straight alcohol, on the other hand, may require either a new distribution system or extensive modifications in the present network, as well as substantial vehicle modifications or alternative engines.[2]

Alcohols (derived from both biomass and coal) and synthetic fuels raise concerns with respect to environmental effects. At the present stage of alcohol fuel research, the main environmental concern is with aldehyde emissions—photochemically reactive compounds which are not yet regulated.[3] Similarly, the high aromatic content expected in synthetic fuels raises the specter of high poly-nuclear-aromatic (PNA) emissions. Like aldehydes, PNAs are unregulated. In both cases the scope of any environmental problems and potential remedies have not been defined.[4]

In addition to environmental questions, the high aromaticity of synfuels presents a toxicity problem. Benzene, one very toxic aromatic compound, has been implicated in certain cases of leukemia and is believed to harm blood-forming organs after prolonged exposure.[5] At present, the EPA is developing proposed regulations covering benzene emissions. Synfuels are a likely target for these regulations.

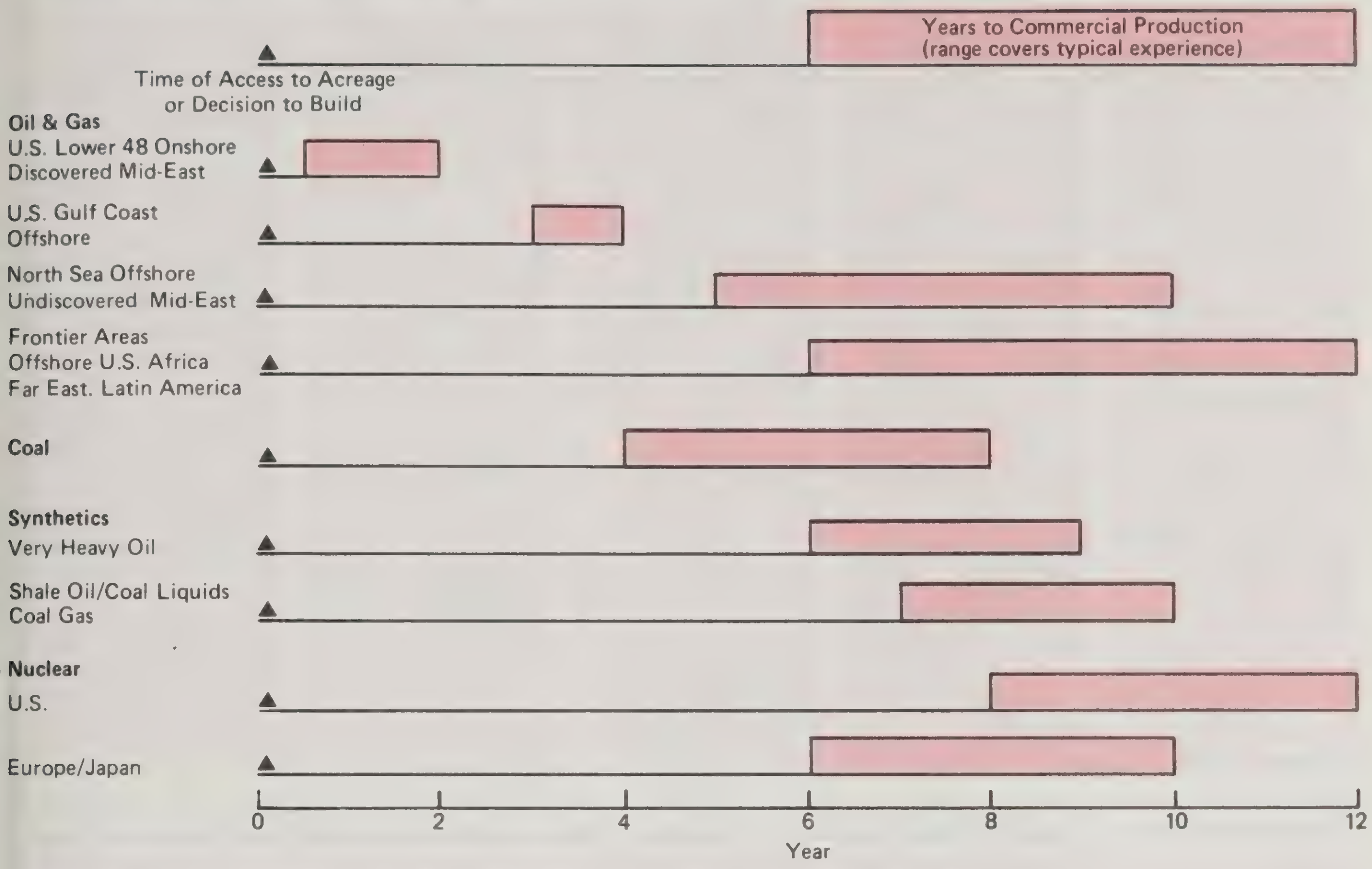
Potential environmental, health, and safety impacts from various energy technologies have been investigated by the NTPSC. It is believed that a shift from conventional sources of oil to coal liquefaction and gasification, oil shale retorting, and electricity generation from coal, even under controlled technologies, could involve a significant increase in potential adverse impacts to health, safety, and the environment. Less harmful effects appear to be associated with coal liquefaction, surface oil-shale retorting and high-Btu coal-gasification systems compared with the generation of electricity from coal or with in-situ shale retorting.

APPENDIX FIGURE III–1. Energy production technologies' fuel cycles.


Coal
Direct Combustion
Heat
Industrial
Electricity
Industry
Residential/Commercial
Transportation
Solvent Refining (SRC-I)
Direct Combustion
Electricity
Industry
Residential/Commercial
Transportation
Heat
Industrial
Light Rail
Pipeline
Heavy Rail
Electric Vehicles
Low and Int. Btu Gas
Low Btu Gas
Industrial
Int. Btu Gas
Combined Cycle Electric Product
Electricity
Industrial
Residential/Commercial
Transportation
Ammonia Production
Ammonia
Feedstocks
Indirect Liquefaction Processes (first such process was Fischer – Tropsch)
Methanol
Feedstocks
Transportation
Highway Vehicles: Otto Cycle Engines (blends) Gas Turbine Engine Stirling Engine
Gasoline
Transportation (highway, air)
Liquid Organics (straight chain i.e., aliphatics)
Feedstocks
Highway Vehicles: Otto Cycle Engine Gas Turbine Engine Stirling Engine Propeller Aircraft
Direct Liquefaction Processes (first such process was Bergius)
Refining
Gases
Industrial
Oil Shale
Surface Retorting
Syncrude Predominantly Ring Structure (i.e., aromatic)
Gasoline
Transportation
Jet Aircraft Highway Vehicles: Gas Turbine Engine Stirling Engine
Kerosine
Transportation
Underground Retorting (in situ)
Synthetic Crude, Predominantly Ring Structure (i.e., aromatic)
Diesel Fuels
Transportation
Industrial
Heavy Rail Highway Vehicles: Diesel Engines Marine: Diesel Engines Pipeline
Resids
Industrial
Residential/Commercial
Transportation
Marine: Steam Engine Diesel Engine Gas Turbine Engine
Biomass
Biomass Conversion Processing
Alcohol
Feedstocks
Transportation
High Btu Gas
Industrial
Residential/Commercial
Transportation
Highway Vehicles: Otto Cycle Engine Gas Turbine Engine Stirling Engine
Geo-Pressured Methane
Advanced Extraction Technologies
Natural Gas
Industrial
Residential/Commercial
Transportation
Pipeline Compressors
Solar
Various Technologies
Heat
Residential/Commercial
Electricity
Residential/Commercial

SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–2. Energy supply lead times.



SOURCE: Exxon Corporation Public Affairs Department, *World Energy Outlook*, New York: 1976, p. 17.

APPENDIX TABLE III–1. Sources of liquid fuels, medium-growth scenario (quadrillion Btu per year)

Resource	1975	1980	1985	1990	1995	2000
Domestic Crude	18.60	15.97	15.47	16.63	19.82	18.80
Crude Imports[a]	11.73	19.28	20.51	20.10	17.04	13.76
Coal Liquids[b]	—	—	.01	.01	1.62	6.34
Shale Syncrude	—	—	.04	.14	.19	2.22
Methanol Imports	—	.01	.18	.32	.38	.34

[a] Including petroleum products.

[b] Including syncrude, methanol and residual from coal.

APPENDIX TABLE III–2. Liquid fuel energy: production to consumption, medium-growth scenario, 1975 (quadrillion Btus per year)

Primary Products		Refinery Products		Transportation Fuels		Other End Uses for Petroleum Products		Trans End Use By Mode	
Domestic Crude	18.60	Gasoline	15.254	Gasoline	12.733	Naptha-type Feedstock	2.509	Personal Vehicle	
								Gasoline	10.79
								Diesel	
								Methanol	
								Electricity	
Syncrude Shale Oil		Distillate	8.207	Distillates		(R/C Distillate,		Truck	
				Diesel: Auto & Local Truck		Rural Distillate)	2.906	Gasoline	1.91
								Diesel	1.51
				Jet Fuel	2.008	Industrial Distillate	.413	Methanol	
				Other Diesel	2.218	Electricity	.339		
Imported Crude	11.73							Aircraft	
								Jet Fuel	2.01
						Lubes, Waxes, Asphalts	.682	Rail	
								Diesel	.50
								Bus	
Residual from Coal—		Residual from refineries	4.894			R/C Residual	.226	Diesel	.03
						Industrial Residual	1.533	Oil Pipeline	
		Residual including supplies directly from coal		Marine Bunker	.388	Electricity	2.381	Diesel	.12
				Non-Petroleum Fuels				Marine Bunker	.39
				Methanol					
				Electricity					

SOURCE: NTPSC forecasts.

APPENDIX TABLE III–3. Liquid fuel energy: production to consumption, medium-growth scenario, 1985 (quadrillion Btus per year)

Primary Products		Refinery Products		Transportation Fuels		Other End Uses for Petroleum Products		Trans End Use By Mode	
Domestic Crude	15.473	Gasoline	17.116	Gasoline	12.616	Naptha-type Feedstock	4.499	Personal Vehicle	
								Gasoline	10.09
								Diesel	.72
								Methanol	.14
								Electricity	
Syncrude Shale Oil	.038	Distillate	11.953	Distillates		R/C Distillate	1.965	Truck	
						Rural Distillate	.861	Gasoline	2.52
				Diesel: Auto & Local Truck	.904	Industrial Distillate	1.319	Diesel	2.64
				Jet Fuel	2.984			Methanol	.03
				Other Diesel	3.426	Electricity	.108		
Imported Crude	20.508							Aircraft	
								Jet Fuel	2.98
						Lubes, Waxes, Asphalts	.855	Rail	
								Diesel	.90
								Bus	
Residual from Coal	0	Residual from Refineries	4.778			R/C Residual	.420	Diesel	.04
						Industrial Residual	1.641	Oil Pipeline	
		Residual including supplies directly from coal	4.778	Marine Bunker	.569	Electricity	1.621	Diesel	.12
				Non-Petroleum fuels				Marine Bunker	.57
				Methanol	.181				
				Electricity					

SOURCE: NTPSC forecasts.

APPENDIX TABLE III–4. Liquid fuel energy: production to consumption, medium-growth scenario, 2000 (quadrillion Btus per year)

Primary Products		Refinery Products		Transportation Fuels		Other End Uses for Petroleum Products		Trans End Use By Mode	
Domestic Crude	18.801	Gasoline	16.620	Gasoline	8.775	Naptha-type Feedstock	7.841	Personal Vehicle	
								Gasoline	6.49
								Diesel	1.73
								Methanol	.37
								Electricity	.08
Syncrude	5.212								
Shale Oil	2.214	Distillate	17.704	Distillates Diesel:		R/C Distillate	1.826	Truck	
						Rural Distillate	.702	Gasoline	2.28
				Auto & Local Truck	2.339			Diesel	4.36
				Jet Fuel	4.966	Industrial Distillate	1.962	Methanol	.13
				Other Diesel	5.208	Electricity	.221		
Imported Crude	13.759							Aircraft	
								Jet Fuel	4.97
								Rail	
						Lubes, Waxes, Asphalts	1.079	Diesel	1.20
								Bus	
								Diesel	.05
Residual from Coal	.919					R/C Residual	.373	Oil Pipeline	
		Residual from Refineries	3.697					Diesel	.21
				Marine Bunker	.891	Industrial Residual	1.382		
		Residual including supplies directly from coal	4.616			Electricity	1.378		
				Non-Petroleum Fuels				Marine Bunker	.89
				Methanol	.504				
				Electricity	.079				

SOURCE: NTPSC forecasts.

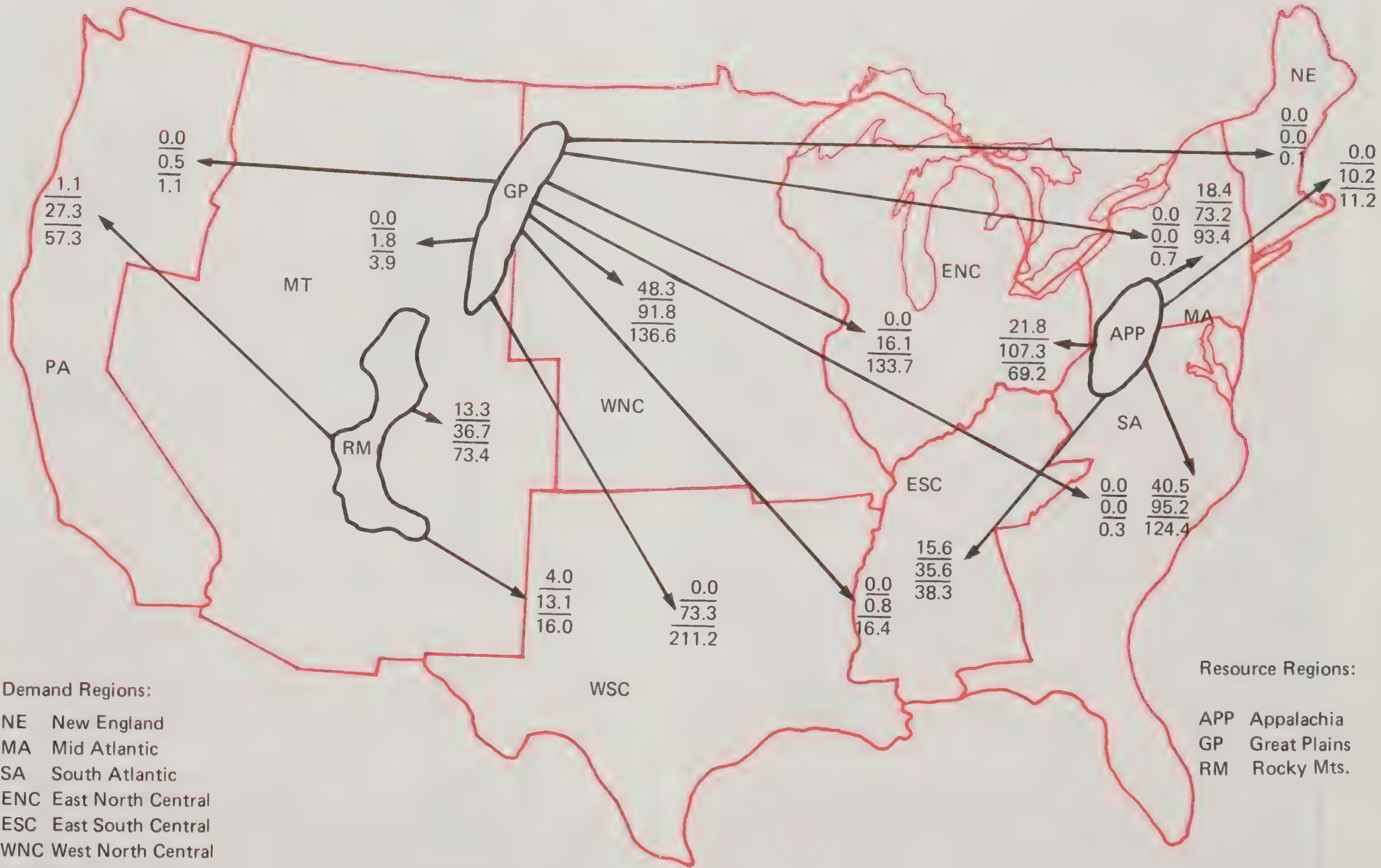
ENERGY MOVEMENTS

Because the potential movements of coal and other energy commodities could have substantial effects on the U.S. transport system to the year 2000, the following maps are provided.

NOTES AND REFERENCES

1. University of Oklahoma, Science and Public Policy Program, *Energy Alternatives: A Comparative Analysis,* prepared for Council on Environmental Quality, Washington, D.C.: Government Printing Office, 1975.
2. U.S. Department of Energy, *Utilization of Potential Alternative Transportation Automotive Fuel Composition 1985–2000,* Report No. DOE HCP/W3864–01/1 Washington, D.C.: 1978.
3. *Ibid.*
4. *Ibid.*
5. *Ibid.*

APPENDIX FIGURE III–3. Inter-regional transport of low sulfur coal, medium-growth scenario, 1975, 1985, and 2000 (million short tons per year).


NE
0.0
0.0
0.1
0.0
10.2
11.2
GP
0.0
0.5
1.1
1.1
27.3
57.3
0.0
1.8
3.9
MT
PA
RM
13.3
36.7
73.4
48.3
91.8
136.6
WNC
ENC
0.0
16.1
133.7
18.4
73.2
93.4
0.0
0.0
0.7
APP
MA
21.8
107.3
69.2
SA
ESC
0.0
0.0
0.3
40.5
95.2
124.4
15.6
35.6
38.3
0.0
0.8
16.4
4.0
13.1
16.0
0.0
73.3
211.2
WSC

Demand Regions:

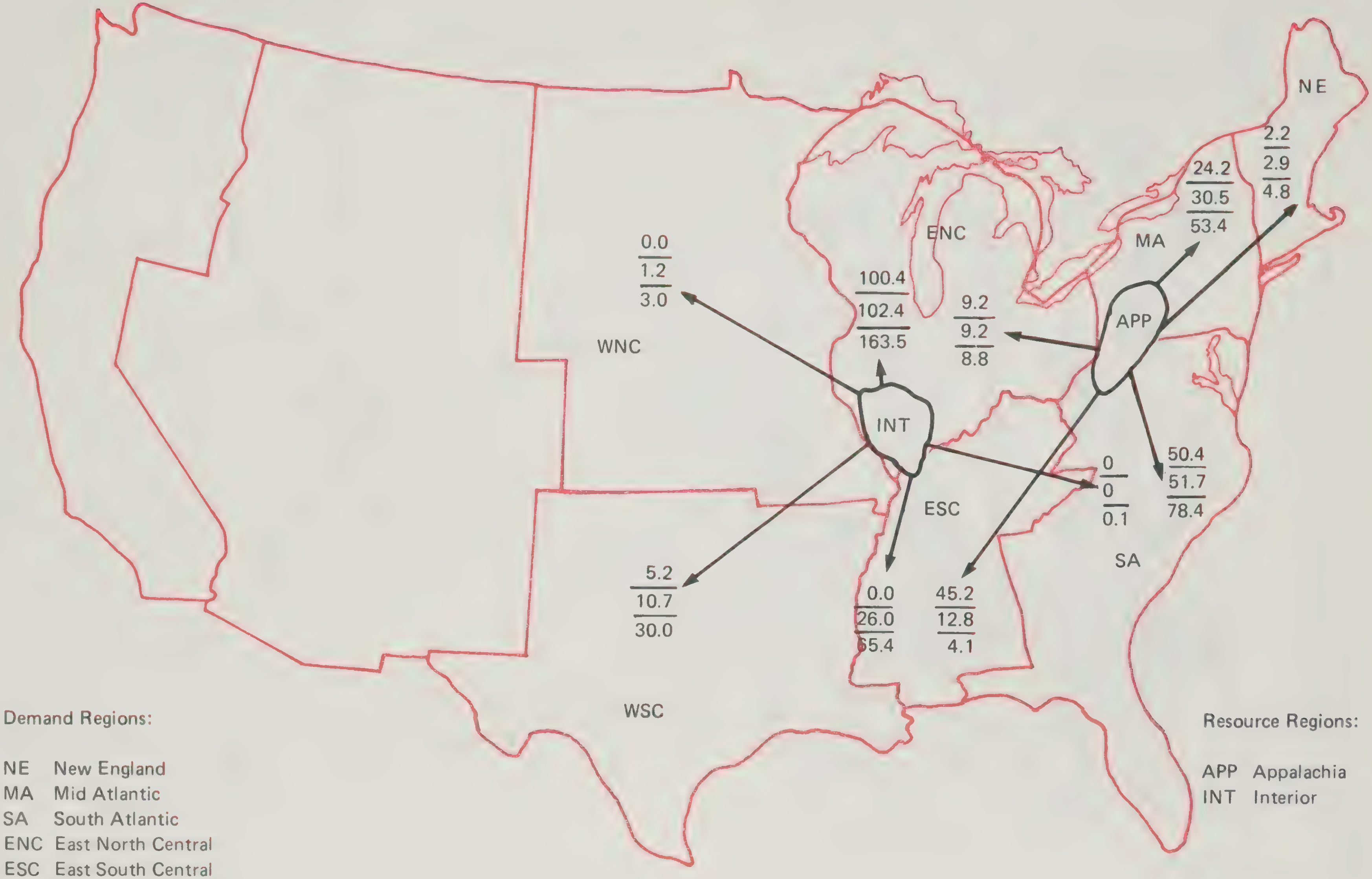
NE New England
MA Mid Atlantic
SA South Atlantic
ENC East North Central
ESC East South Central
WNC West North Central
WSC West South Central
PA Pacific
MT Mountain

Resource Regions:

APP Appalachia
GP Great Plains
RM Rocky Mts.

SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–4. Inter-regional transport of high sulfur coal, medium-growth scenario, 1975, 1985, and 2000 (million short tons per year).


NE
2.2
2.9
4.8
MA
24.2
30.5
53.4
ENC
APP
INT
100.4
102.4
163.5
9.2
9.2
8.8
WNC
0.0
1.2
3.0
50.4
51.7
78.4
0
0
0.1
SA
ESC
5.2
10.7
30.0
0.0
26.0
65.4
45.2
12.8
4.1
WSC

Demand Regions:

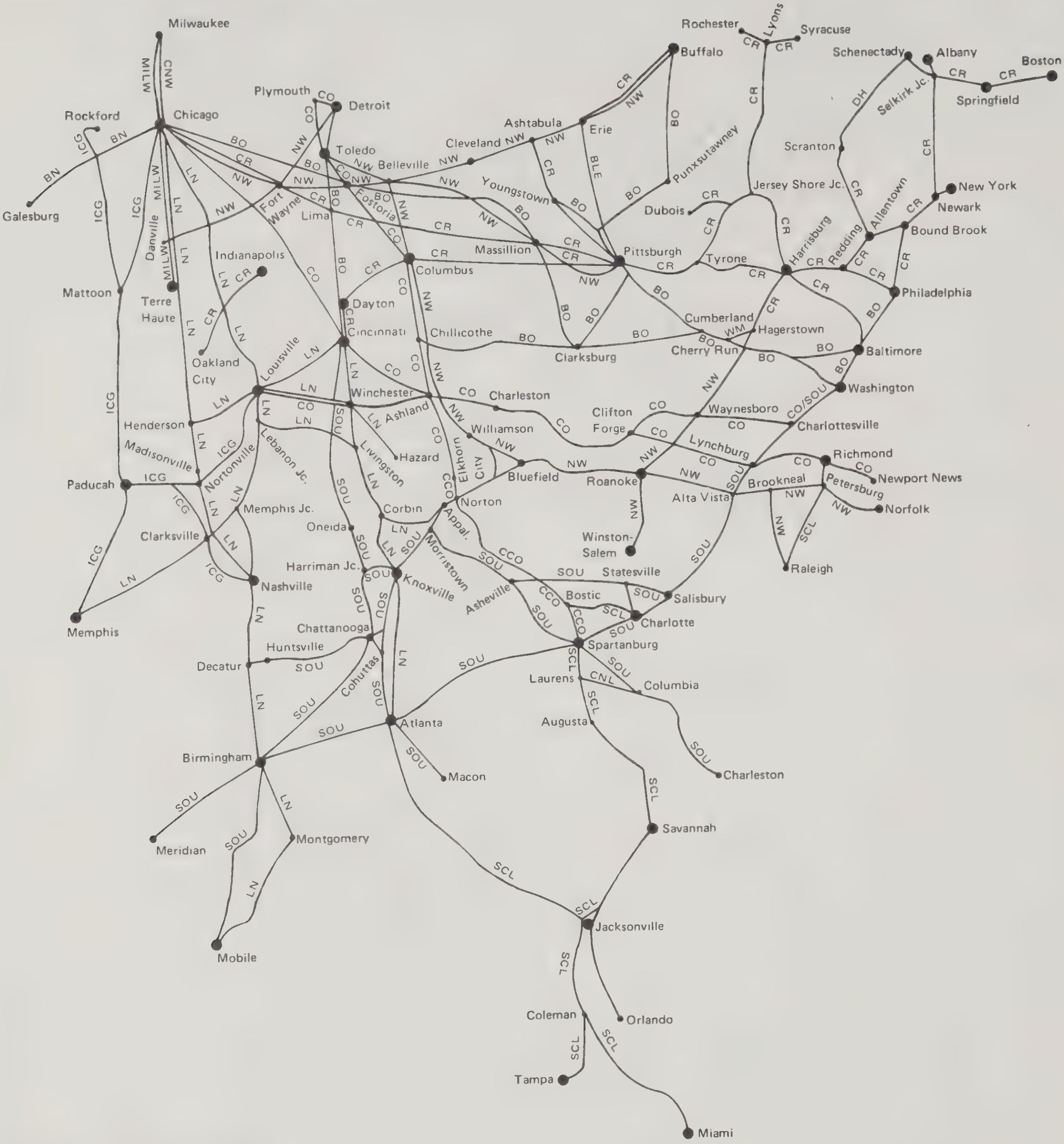
NE New England
MA Mid Atlantic
SA South Atlantic
ENC East North Central
ESC East South Central
WNC West North Central
WSC West South Central

Resource Regions:

APP Appalachia
INT Interior

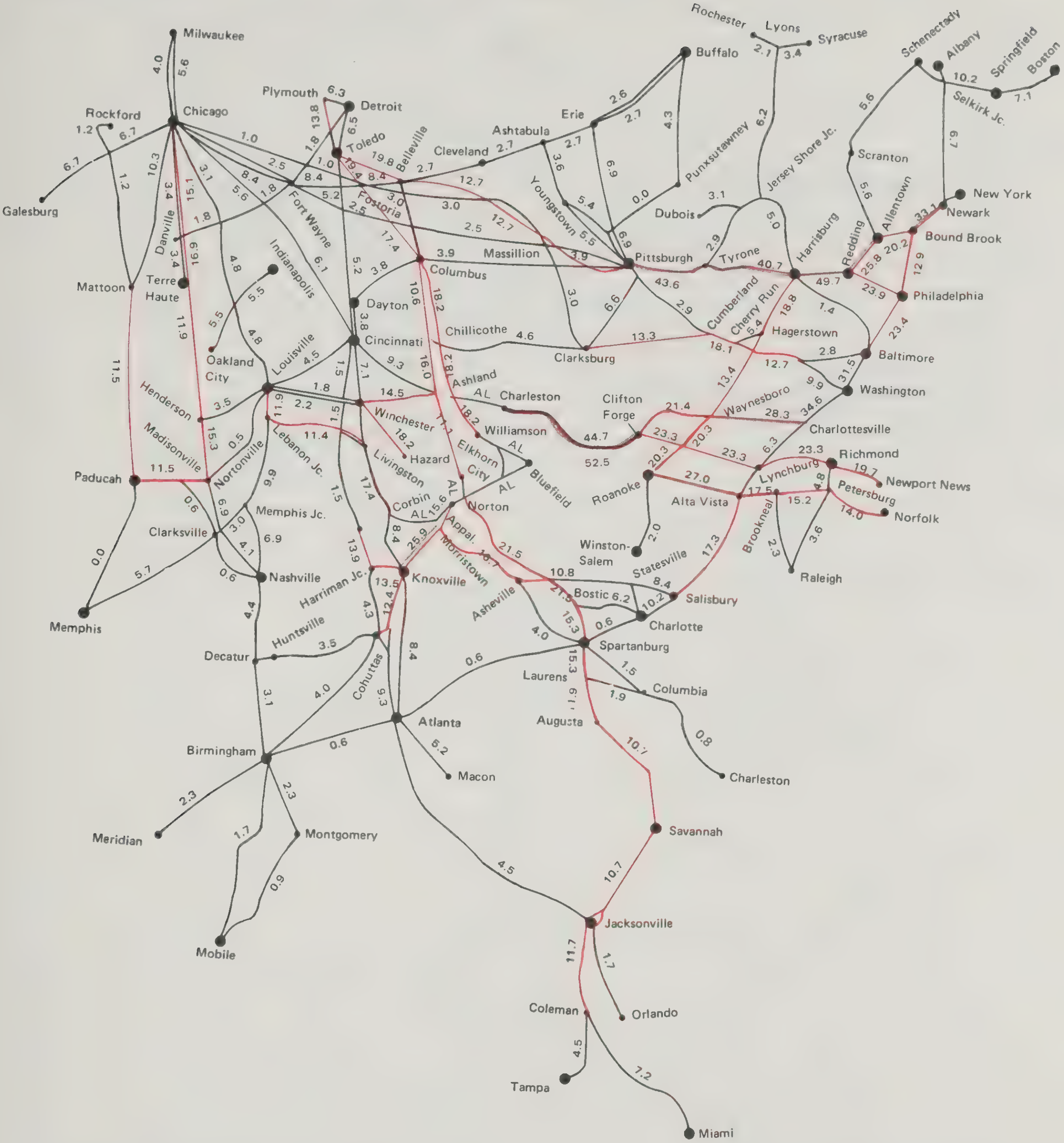
SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–5. Eastern road identification map.


Milwaukee
Rochester
Lyons
Syracuse
Buffalo
Schenectady
Albany
Boston
Springfield
Selkirk Jc.
Plymouth
Detroit
Rockford
Chicago
Ashtabula
Erie
Punxsutawney
Scranton
Toledo
Cleveland
Belleville
Galesburg
Fort Wayne
Lima
Fostoria
Youngstown
Dubois
Jersey Shore Jc.
New York
Newark
Bound Brook
Allentown
Redding
Harrisburg
Danville
Massillion
Pittsburgh
Tyrone
Indianapolis
Columbus
Mattoon
Terre Haute
Dayton
Philadelphia
Cumberland
Hagerstown
Cincinnati
Chillicothe
Clarksburg
Cherry Run
Baltimore
Oakland City
Louisville
Washington
Winchester
Ashland
Charleston
Clifton Forge
Waynesboro
Charlottesville
Henderson
Williamson
Hazard
Lynchburg
Richmond
Newport News
Madisonville
Lebanon Jc.
Livingston
Elkhorn City
Bluefield
Roanoke
Brookneal
Petersburg
Norfolk
Paducah
Nortonville
Norton
Alta Vista
Memphis Jc.
Corbin
Oneida
Appal.
Clarksville
Morristown
Winston-Salem
Raleigh
Harriman Jc.
Knoxville
Statesville
Nashville
Bostic
Salisbury
Asheville
Charlotte
Memphis
Chattanooga
Spartanburg
Huntsville
Decatur
Cohuttas
Laurens
Columbia
Atlanta
Augusta
Birmingham
Macon
Charleston
Savannah
Meridian
Montgomery
Mobile
Jacksonville
Coleman
Orlando
Tampa
Miami
MILW
CNW
BN
ICG
CO
NW
BO
CR
LN
BLE
DH
WM
SOU
CO/SOU
CCO
SCL
CNL

SOURCE: NTPSC forecasts.

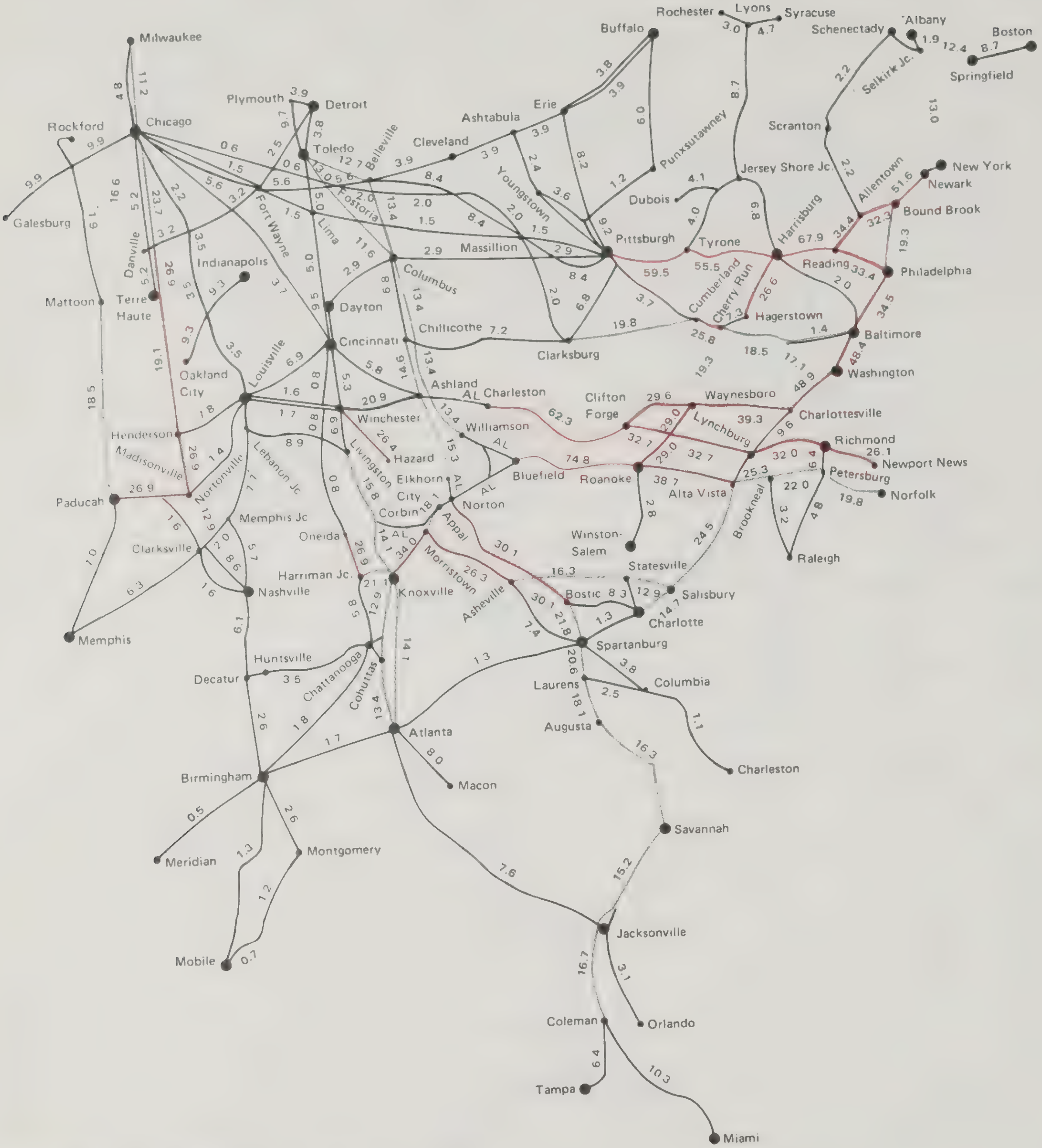
APPENDIX FIGURE III–6. Projection of eastern coal by rail, 1985


Milwaukee
Rockford
Chicago
Galesburg
Plymouth
Detroit
Toledo
Belleville
Fostoria
Fort Wayne
Indianapolis
Danville
Mattoon
Terre Haute
Ashtabula
Cleveland
Erie
Youngstown
Buffalo
Rochester
Lyons
Syracuse
Punxsutawney
Dubois
Jersey Shore Jc.
Schenectady
Albany
Springfield
Boston
Selkirk Jc.
Scranton
Allentown
Redding
New York
Newark
Bound Brook
Philadelphia
Massillion
Columbus
Pittsburgh
Tyrone
Harrisburg
Dayton
Cincinnati
Chillicothe
Clarksburg
Cumberland
Cherry Run
Hagerstown
Baltimore
Washington
Oakland City
Louisville
Henderson
Madisonville
Nortonville
Paducah
Ashland
Charleston
Clifton Forge
Waynesboro
Charlottesville
Winchester
Williamson
Hazard
Lebanon Jc.
Livingston
Elkhorn City
Bluefield
Roanoke
Lynchburg
Richmond
Newport News
Petersburg
Norfolk
Alta Vista
Brookneal
Raleigh
Memphis Jc.
Clarksville
Corbin
Norton
Appal.
Morristown
Winston-Salem
Statesville
Salisbury
Nashville
Harriman Jc.
Knoxville
Asheville
Bostic
Charlotte
Memphis
Huntsville
Decatur
Cohuttas
Spartanburg
Laurens
Columbia
Augusta
Atlanta
Birmingham
Macon
Charleston
Meridian
Montgomery
Savannah
Mobile
Jacksonville
Coleman
Orlando
Tampa
Miami
AL

AL = Access Link: coal tonnage varies greatly on these links, depending on locations of mines.

Numerals indicate annual coal tonnage (in millions of tons) on each rail segment.

APPENDIX FIGURE III–7. Projection of eastern coal by rail, 2000.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Indianapolis
Oakland City
Plymouth
Detroit
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Fort Wayne
Lima
Fostoria
Belleville
Cleveland
Ashtabula
Erie
Buffalo
Rochester
Lyons
Syracuse
Schenectady
Albany
Boston
Springfield
Selkirk Jc.
Scranton
Punxsutawney
Jersey Shore Jc.
Dubois
Youngstown
Massillion
Pittsburgh
Tyrone
Harrisburg
Allentown
New York
Newark
Bound Brook
Reading
Philadelphia
Cumberland
Cherry Run
Hagerstown
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Harriman Jc.
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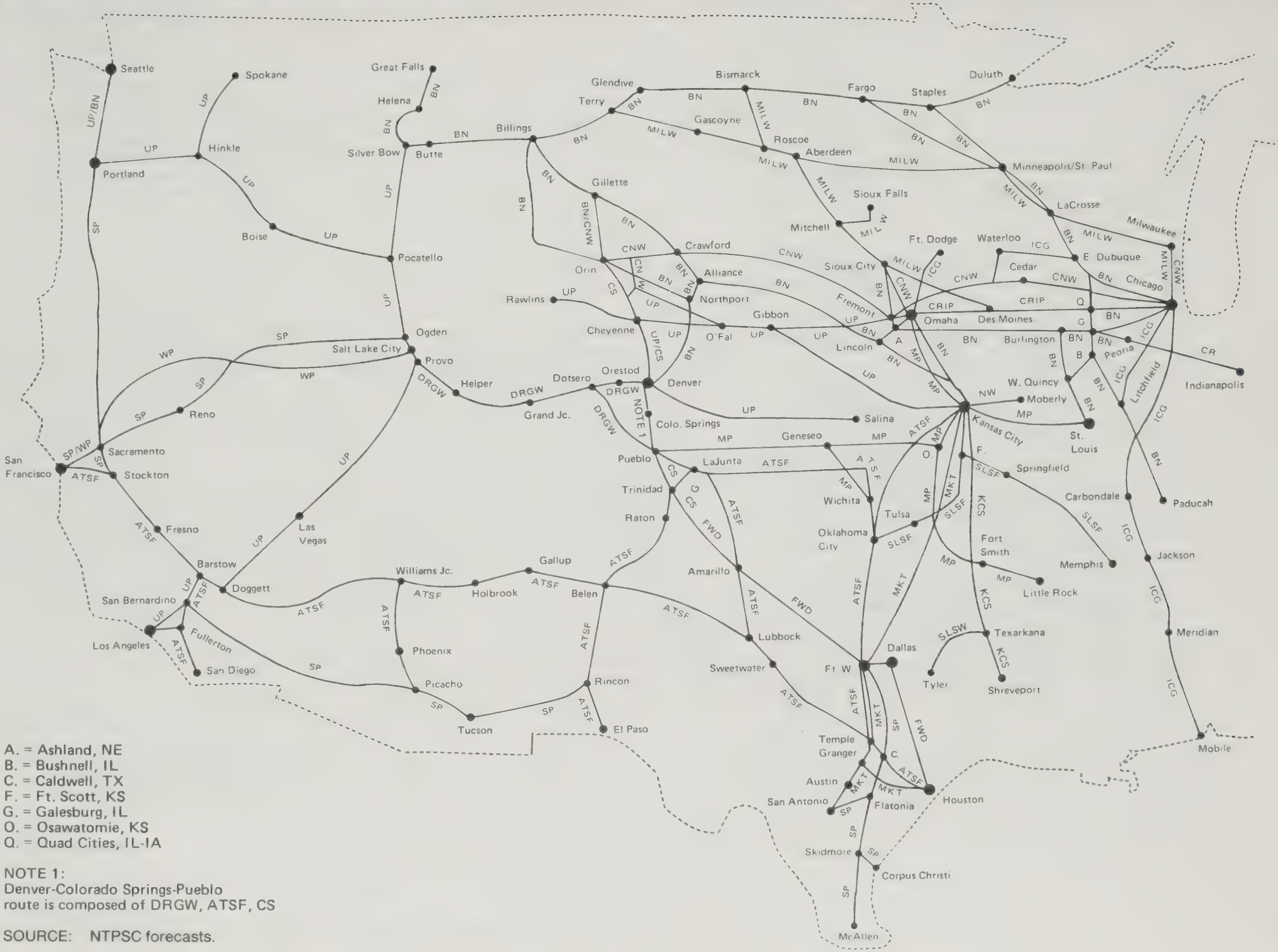
Morristown
Asheville
Winston-Salem
Statesville
Salisbury
Bostic
Charlotte
Spartanburg
Memphis
Decatur
Huntsville
Chattanooga
Cohuttas
Atlanta
Laurens
Columbia
Augusta
Charleston
Birmingham
Macon
Savannah
Meridian
Montgomery
Mobile
Jacksonville
Orlando
Coleman
Tampa
Miami
AL

AL = Access Link: coal tonnage varies greatly on these links, depending on locations of mines.

Numerals indicate annual coal tonnage (in millions of tons) on each rail segment.

SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–8. **Western railroad identification map.**

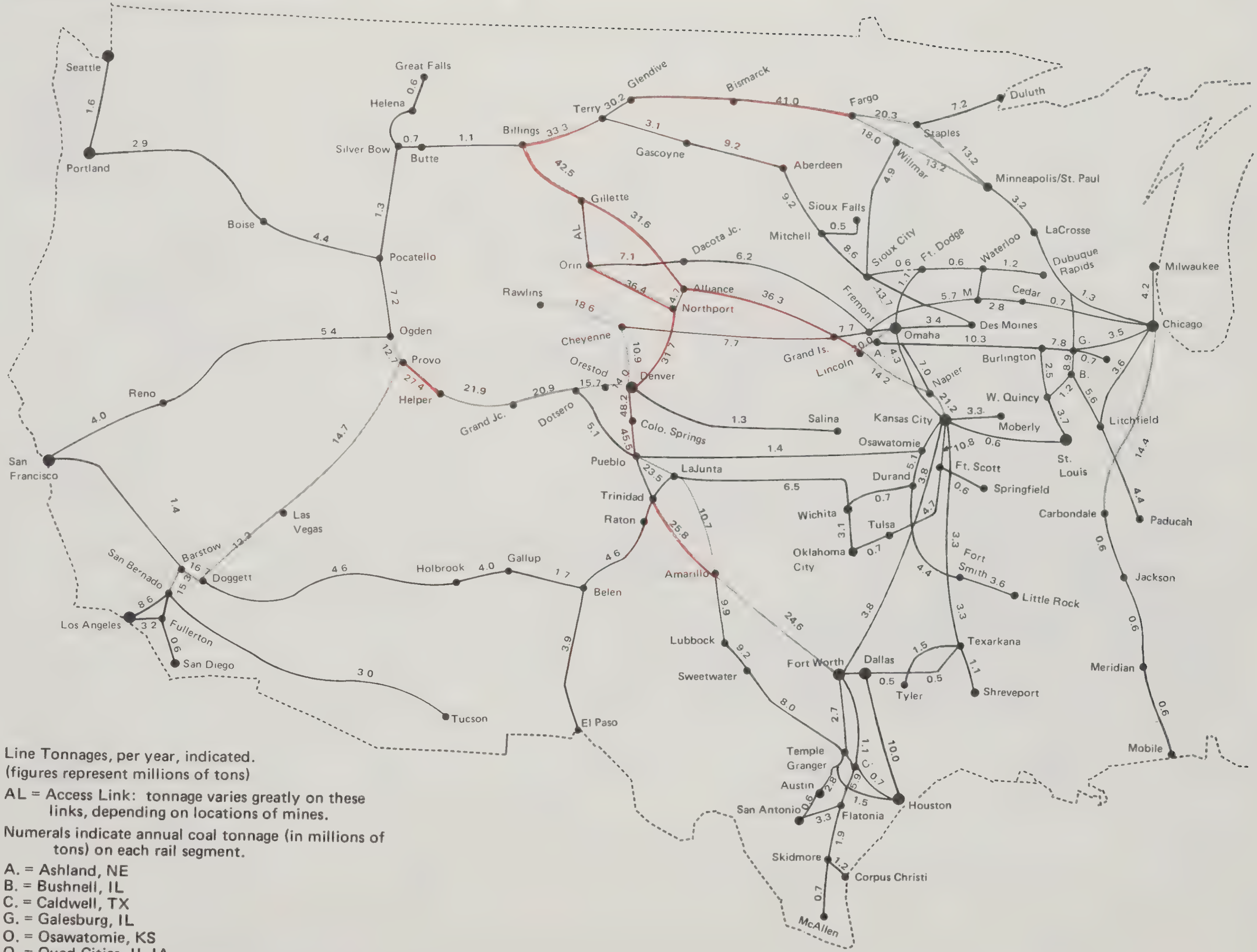

Seattle
Spokane
Great Falls
Helena
Silver Bow
Butte
Billings
Glendive
Terry
Bismarck
Gascoyne
Fargo
Staples
Duluth
Roscoe
Aberdeen
Minneapolis/St Paul
LaCrosse
Milwaukee
Portland
Hinkle
Boise
Pocatello
Gillette
Sioux Falls
Mitchell
Waterloo
E Dubuque
Ft. Dodge
Cedar
Chicago
Orin
Crawford
Alliance
Northport
Rawlins
Cheyenne
O'Fal
Gibbon
Sioux City
Fremont
Omaha
Des Moines
Q
G
Burlington
B
Peoria
Litchfield
Indianapolis
Ogden
Salt Lake City
Provo
Helper
Dotsero
Orestod
Denver
Lincoln
A
W. Quincy
Moberly
Kansas City
St. Louis
Reno
Sacramento
San Francisco
Stockton
Grand Jc.
Colo. Springs
Salina
Pueblo
Geneseo
O.
F.
Springfield
LaJunta
Trinidad
Raton
Wichita
Tulsa
Oklahoma City
Fort Smith
Carbondale
Paducah
Memphis
Jackson
Little Rock
Fresno
Las Vegas
Barstow
Doggett
San Bernardino
Los Angeles
Fullerton
San Diego
Williams Jc.
Holbrook
Gallup
Belen
Amarillo
Phoenix
Picacho
Tucson
Rincon
El Paso
Lubbock
Sweetwater
Ft W
Dallas
Texarkana
Tyler
Shreveport
Meridian
Mobile
Temple
Granger
C.
Austin
San Antonio
Flatonia
Houston
Skidmore
Corpus Christi
McAllen
NOTE 1
UP/BN
UP
SP
WP
SP/WP
ATSF
BN
BN/CNW
MILW
CNW
CN W
CS
UP/CS
DRGW
ICG
CRIP
CR
NW
MP
MKT
SLSF
KCS
SLSW
FWD
G

A. = Ashland, NE
B. = Bushnell, IL
C. = Caldwell, TX
F. = Ft. Scott, KS
G. = Galesburg, IL
O. = Osawatomie, KS
Q. = Quad Cities, IL-IA

NOTE 1:
Denver-Colorado Springs-Pueblo
route is composed of DRGW, ATSF, CS

SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–9. Projection of western coal by rail, 1985.


Seattle
Portland
Great Falls
Helena
Silver Bow
Butte
Boise
Pocatello
Ogden
Provo
Helper
Reno
San Francisco
Las Vegas
Barstow
San Bernado
Doggett
Los Angeles
Fullerton
San Diego
Tucson
Billings
Terry
Glendive
Bismarck
Fargo
Gascoyne
Aberdeen
Gillette
AL
Orin
Rawlins
Cheyenne
Orestod
Denver
Dotsero
Grand Jc.
Colo. Springs
Pueblo
LaJunta
Trinidad
Raton
Holbrook
Gallup
Belen
El Paso
Amarillo
Lubbock
Sweetwater
Dacota Jc.
Alliance
Northport
Grand Is.
Lincoln
Fremont
Omaha
A.
Napier
Salina
Kansas City
Osawatomie
Durand
Wichita
Oklahoma City
Tulsa
Mitchell
Sioux Falls
Sioux City
Ft. Dodge
Waterloo
Cedar
M
Des Moines
Staples
Willmar
Duluth
Minneapolis/St. Paul
LaCrosse
Dubuque Rapids
Milwaukee
Chicago
G.
B.
Burlington
W. Quincy
Moberly
St. Louis
Litchfield
Ft. Scott
Springfield
Carbondale
Paducah
Fort Smith
Little Rock
Jackson
Texarkana
Shreveport
Dallas
Tyler
Fort Worth
Meridian
Mobile
Temple
Granger
Austin
C.
San Antonio
Flatonia
Houston
Skidmore
Corpus Christi
McAllen
1.6
2.9
0.6
0.7
1.1
1.3
4.4
7.2
5.4
12.7
27.4
21.9
20.9
15.7
14.0
10.9
48.2
45.5
5.1
23.5
25.8
10.7
4.0
14.7
1.4
12.3
16.7
15.3
8.6
3.2
0.6
3.0
4.6
4.0
1.7
4.6
3.9
33.3
30.2
42.5
41.0
3.1
9.2
20.3
18.0
31.6
7.1
36.4
4.7
31.7
18.6
36.3
6.2
7.7
7.7
10.0
4.3
14.2
7.0
21.2
1.3
1.4
6.5
0.7
3.1
0.7
4.7
3.8
5.1
9.2
0.5
8.6
4.9
13.2
13.2
7.2
3.2
13.7
1.1
0.6
0.6
1.2
5.7
2.8
0.7
3.4
10.3
1.3
4.2
3.5
7.8
6.8
0.7
3.6
2.5
1.2
5.6
3.7
3.3
10.8
0.6
0.6
14.4
4.4
0.6
0.6
0.6
3.3
3.6
4.4
3.3
3.8
24.6
9.9
9.2
8.0
1.5
0.5
0.5
1.1
2.7
1.1
0.7
10.0
5.9
2.8
0.6
1.5
3.3
1.9
1.2
0.7

Line Tonnages, per year, indicated.
(figures represent millions of tons)

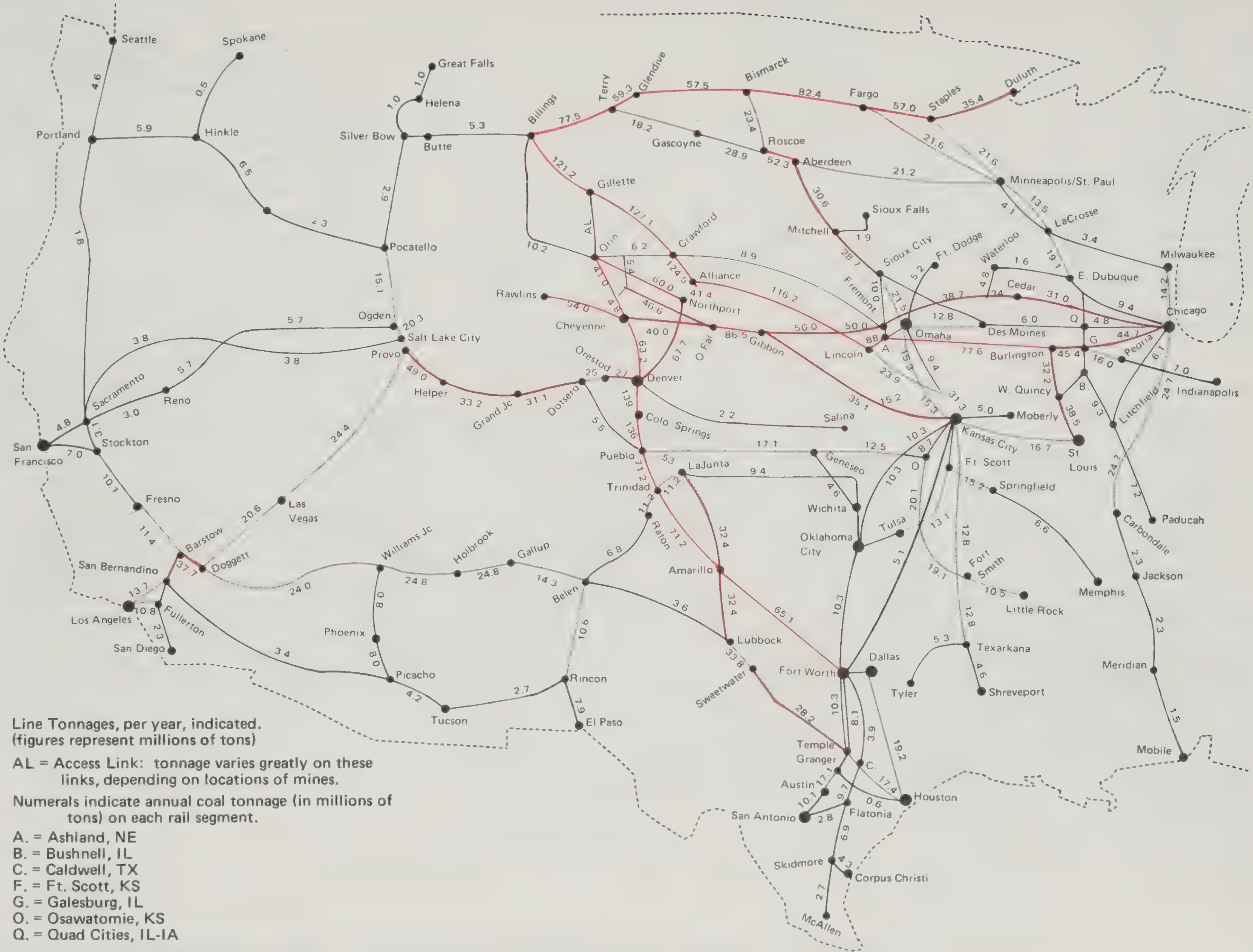
AL = Access Link: tonnage varies greatly on these links, depending on locations of mines.

Numerals indicate annual coal tonnage (in millions of tons) on each rail segment.

A. = Ashland, NE
B. = Bushnell, IL
C. = Caldwell, TX
G. = Galesburg, IL
O. = Osawatomie, KS
Q. = Quad Cities, IL-IA

SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–10. Projection of western coal by rail, 2000.


Seattle
Spokane
Great Falls
Helena
Portland
Hinkle
Silver Bow
Butte
Billings
Terry
Glendive
Bismarck
Fargo
Staples
Duluth
Gascoyne
Roscoe
Aberdeen
Minneapolis/St. Paul
Gillette
Sioux Falls
Mitchell
LaCrosse
Milwaukee
Pocatello
AL
Orin
Crawford
Alliance
Northport
Rawlins
Cheyenne
O Fal
Gibbon
Sioux City
Ft. Dodge
Waterloo
E. Dubuque
Cedar
Fremont
Omaha
Des Moines
Q
Chicago
G
Peoria
Indianapolis
Lincoln
A.
Burlington
W. Quincy
B.
Litchfield
Ogden
Salt Lake City
Provo
Helper
Grand Jc
Dotsero
Orestod
Denver
Colo Springs
Salina
Moberly
Kansas City
St Louis
Sacramento
Reno
San Francisco
Stockton
Pueblo
LaJunta
Geneseo
O
Ft Scott
Springfield
Trinidad
Raton
Wichita
Tulsa
Oklahoma City
Fort Smith
Memphis
Carbondale
Paducah
Jackson
Fresno
Las Vegas
Barstow
Doggett
San Bernandino
Williams Jc
Holbrook
Gallup
Belen
Amarillo
Little Rock
Los Angeles
Fullerton
San Diego
Phoenix
Picacho
Tucson
Rincon
El Paso
Lubbock
Sweetwater
Fort Worth
Dallas
Tyler
Texarkana
Shreveport
Meridian
Mobile
Temple
Granger
C.
Austin
San Antonio
Flatonia
Houston
Skidmore
Corpus Christi
McAllen

Line Tonnages, per year, indicated. (figures represent millions of tons)

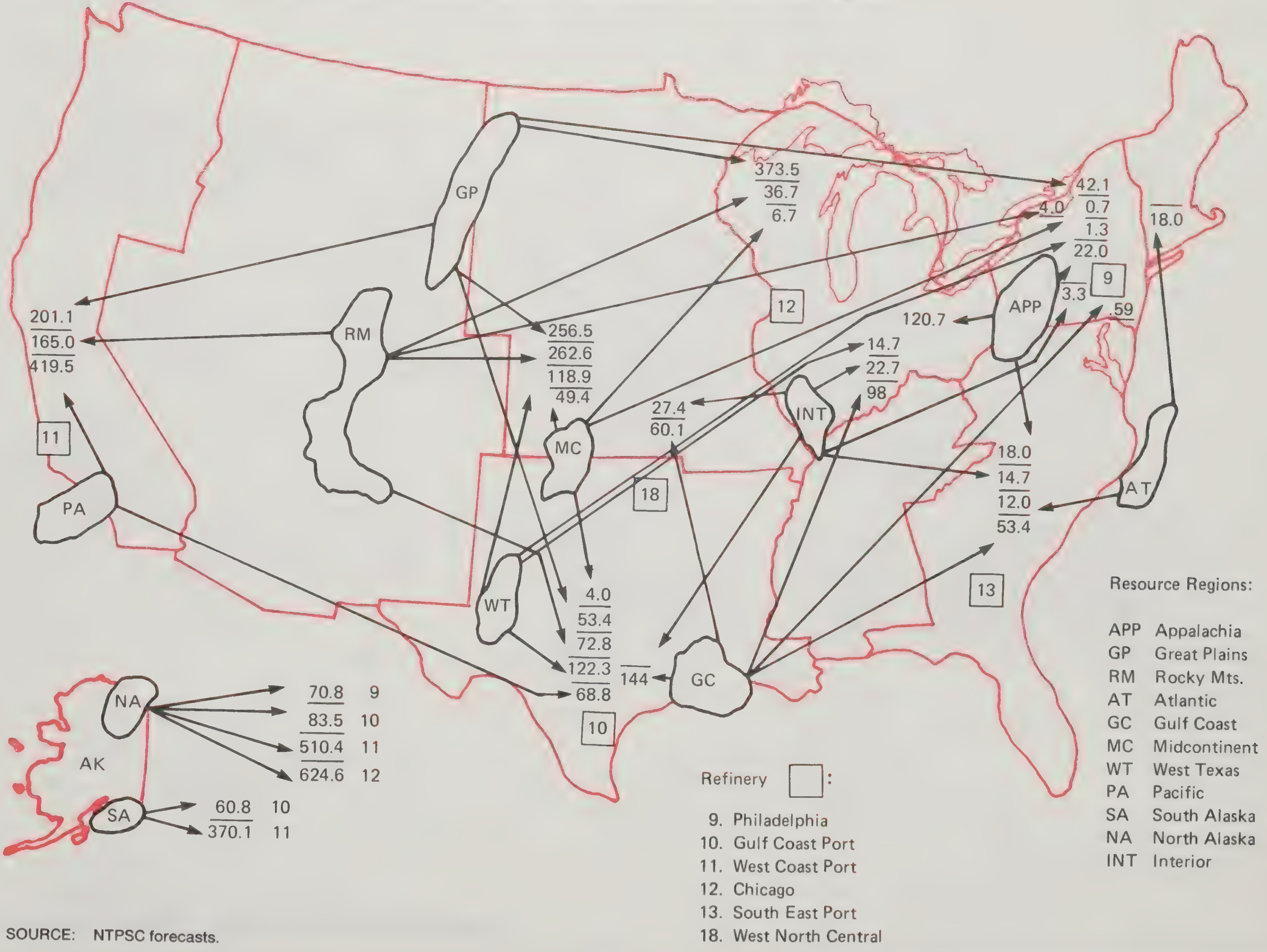
AL = Access Link: tonnage varies greatly on these links, depending on locations of mines.

Numerals indicate annual coal tonnage (in millions of tons) on each rail segment.

A. = Ashland, NE
B. = Bushnell, IL
C. = Caldwell, TX
F. = Ft. Scott, KS
G. = Galesburg, IL
O. = Osawatomie, KS
Q. = Quad Cities, IL-IA

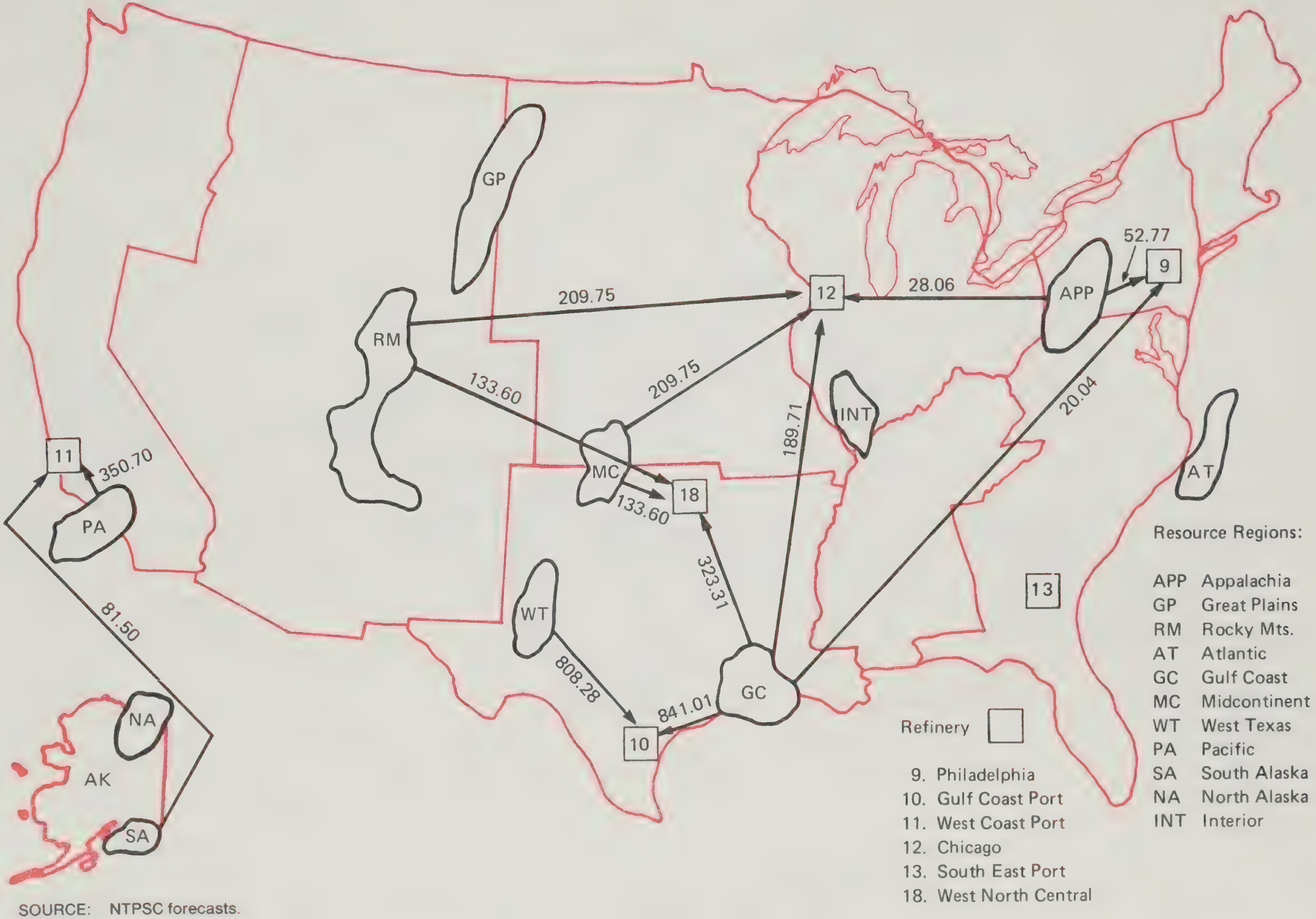
SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–11. Inter-regional transport of crude oil, medium-growth scenario, 1985 (million barrels per year).


GP
RM
MC
WT
PA
GC
INT
APP
AT
NA
SA
AK
201.1
165.0
419.5
11
373.5
36.7
6.7
12
256.5
262.6
118.9
49.4
27.4
60.1
18
14.7
22.7
98
120.7
42.1
4.0
0.7
1.3
22.0
3.3
9
.59
18.0
18.0
14.7
12.0
53.4
13
4.0
53.4
72.8
122.3
68.8
144
10
70.8 9
83.5 10
510.4 11
624.6 12
60.8 10
370.1 11
Refinery □:
9. Philadelphia
10. Gulf Coast Port
11. West Coast Port
12. Chicago
13. South East Port
18. West North Central
Resource Regions:
APP Appalachia
GP Great Plains
RM Rocky Mts.
AT Atlantic
GC Gulf Coast
MC Midcontinent
WT West Texas
PA Pacific
SA South Alaska
NA North Alaska
INT Interior

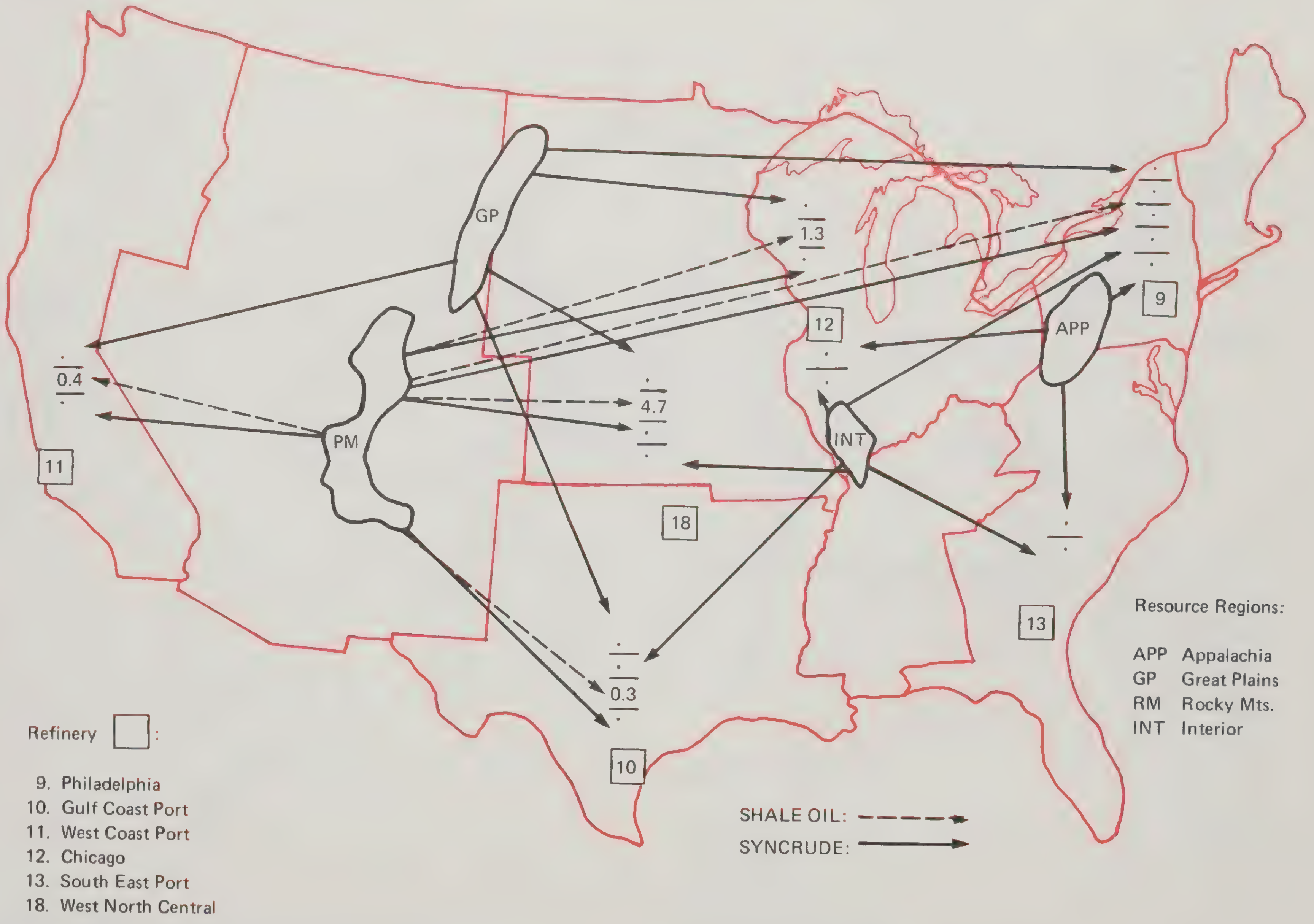
SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–12. Inter-regional transport of crude oil, medium-growth scenario, 2000 (million barrels per year).


GP
RM
PA
AK
NA
SA
WT
MC
GC
INT
APP
AT
9
10
11
12
13
18
209.75
133.60
209.75
133.60
189.71
28.06
52.77
20.04
323.31
841.01
808.28
350.70
81.50
Refinery
9. Philadelphia
10. Gulf Coast Port
11. West Coast Port
12. Chicago
13. South East Port
18. West North Central
Resource Regions:
APP Appalachia
GP Great Plains
RM Rocky Mts.
AT Atlantic
GC Gulf Coast
MC Midcontinent
WT West Texas
PA Pacific
SA South Alaska
NA North Alaska
INT Interior

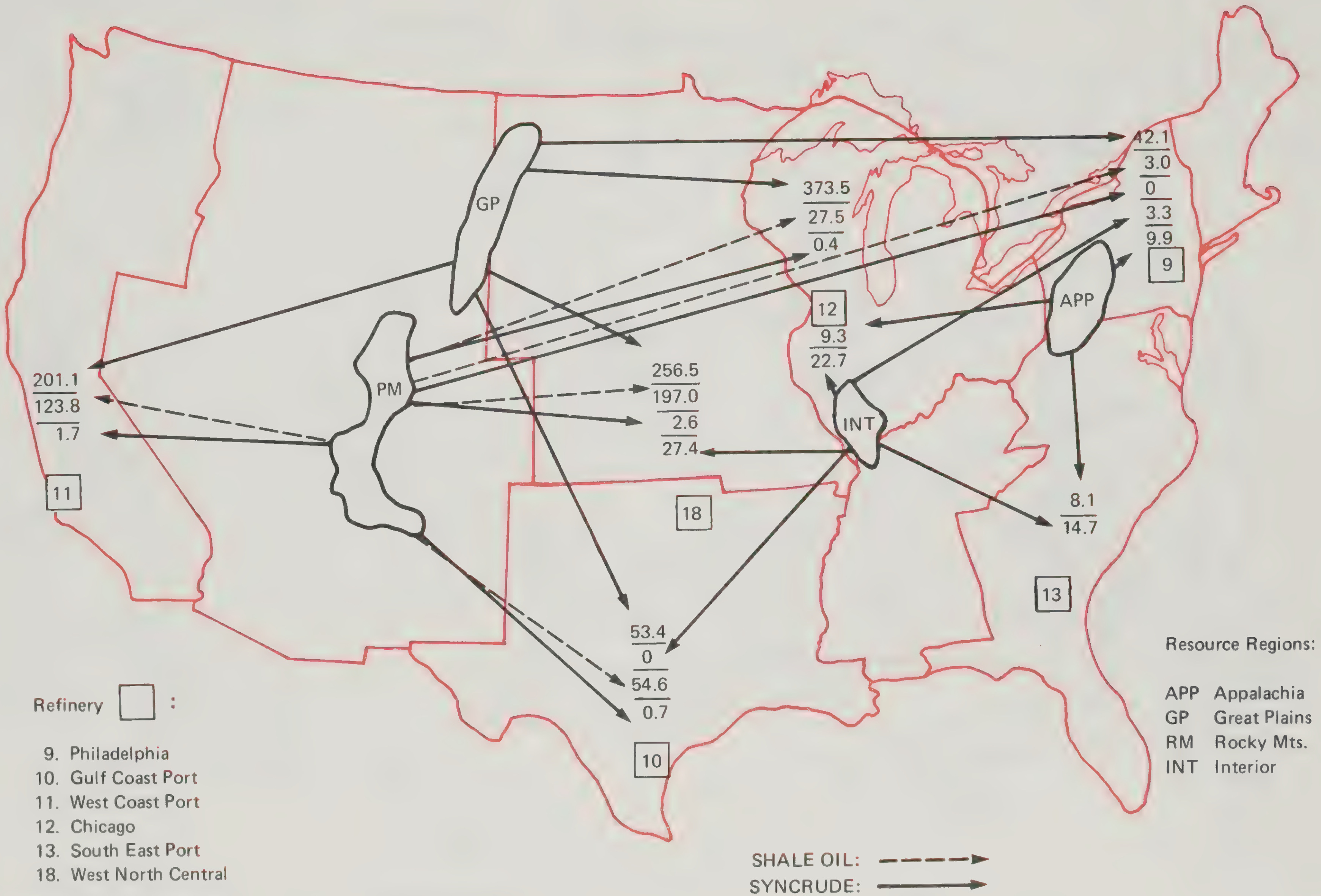
SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–13. Inter-regional transport of synthetic crude oil, medium-growth scenario, 1985 (million barrels per year).


GP
PM
APP
INT
0.4
1.3
4.7
0.3
9
10
11
12
13
18
Refinery ☐:
9. Philadelphia
10. Gulf Coast Port
11. West Coast Port
12. Chicago
13. South East Port
18. West North Central
SHALE OIL:
SYNCRUDE:
Resource Regions:
APP Appalachia
GP Great Plains
RM Rocky Mts.
INT Interior

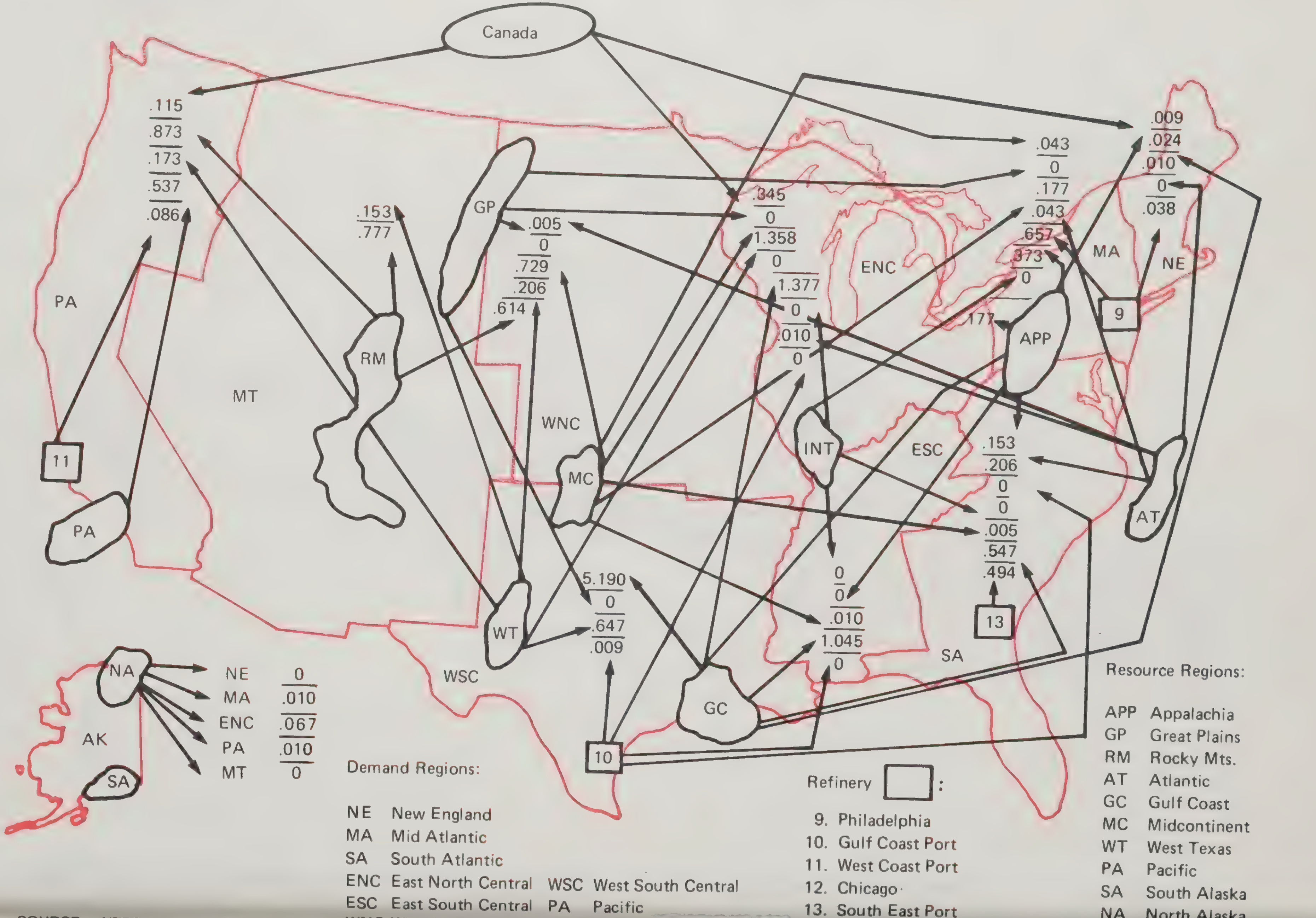
SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–14. Inter-regional transport of synthetic crude oil, medium-growth scenario, 2000 (million barrels per year).

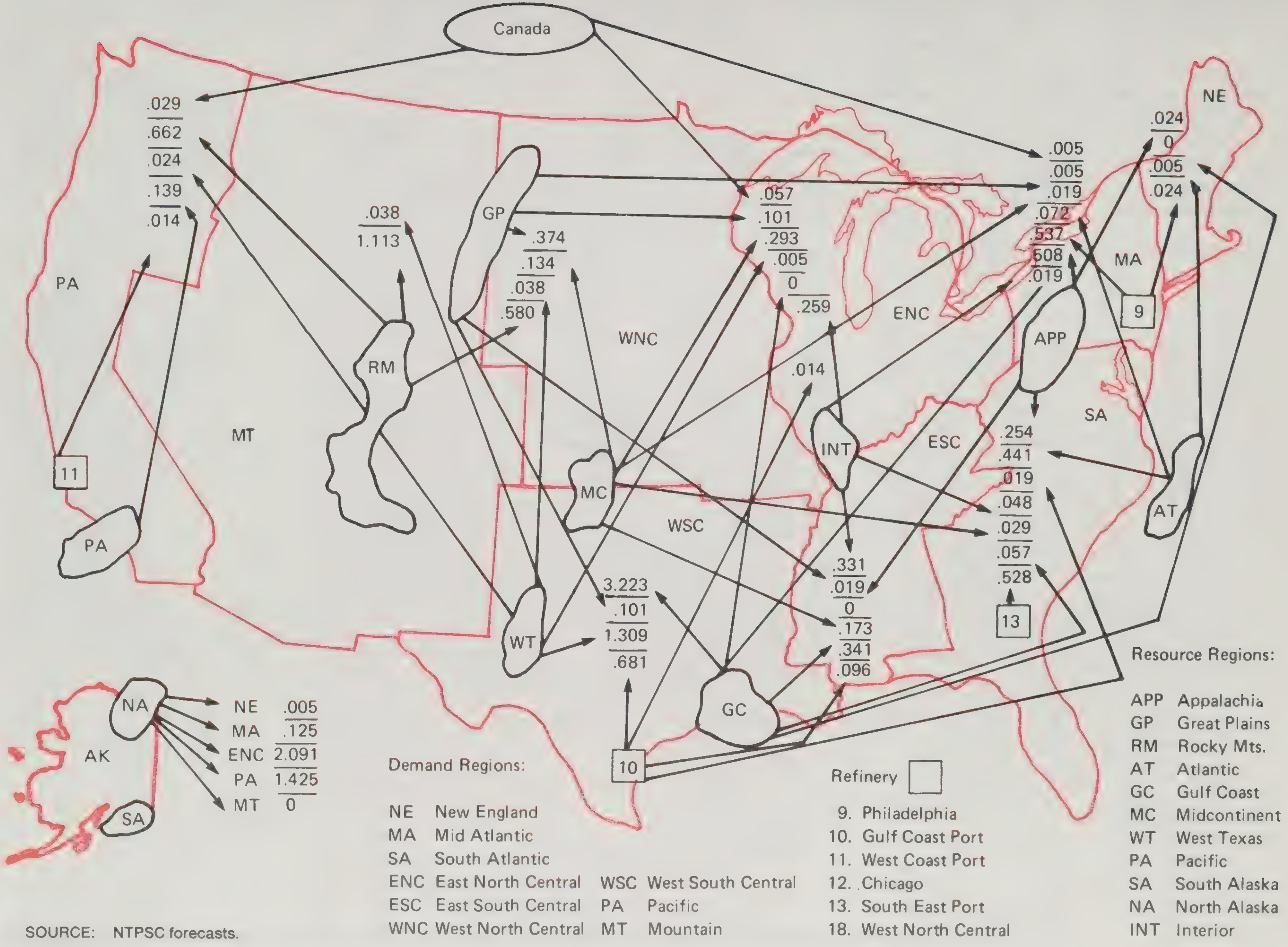

GP
PM
INT
APP
42.1
3.0
0
3.3
9.9
9
373.5
27.5
0.4
12
9.3
22.7
256.5
197.0
2.6
27.4
201.1
123.8
1.7
11
18
8.1
14.7
13
53.4
0
54.6
0.7
10
Refinery ☐ :
9. Philadelphia
10. Gulf Coast Port
11. West Coast Port
12. Chicago
13. South East Port
18. West North Central
Resource Regions:
APP Appalachia
GP Great Plains
RM Rocky Mts.
INT Interior
SHALE OIL:
SYNCRUDE:

SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–15. Inter-regional transport of natural gas, medium-growth scenario, 1975 (trillion cubic feet per year).

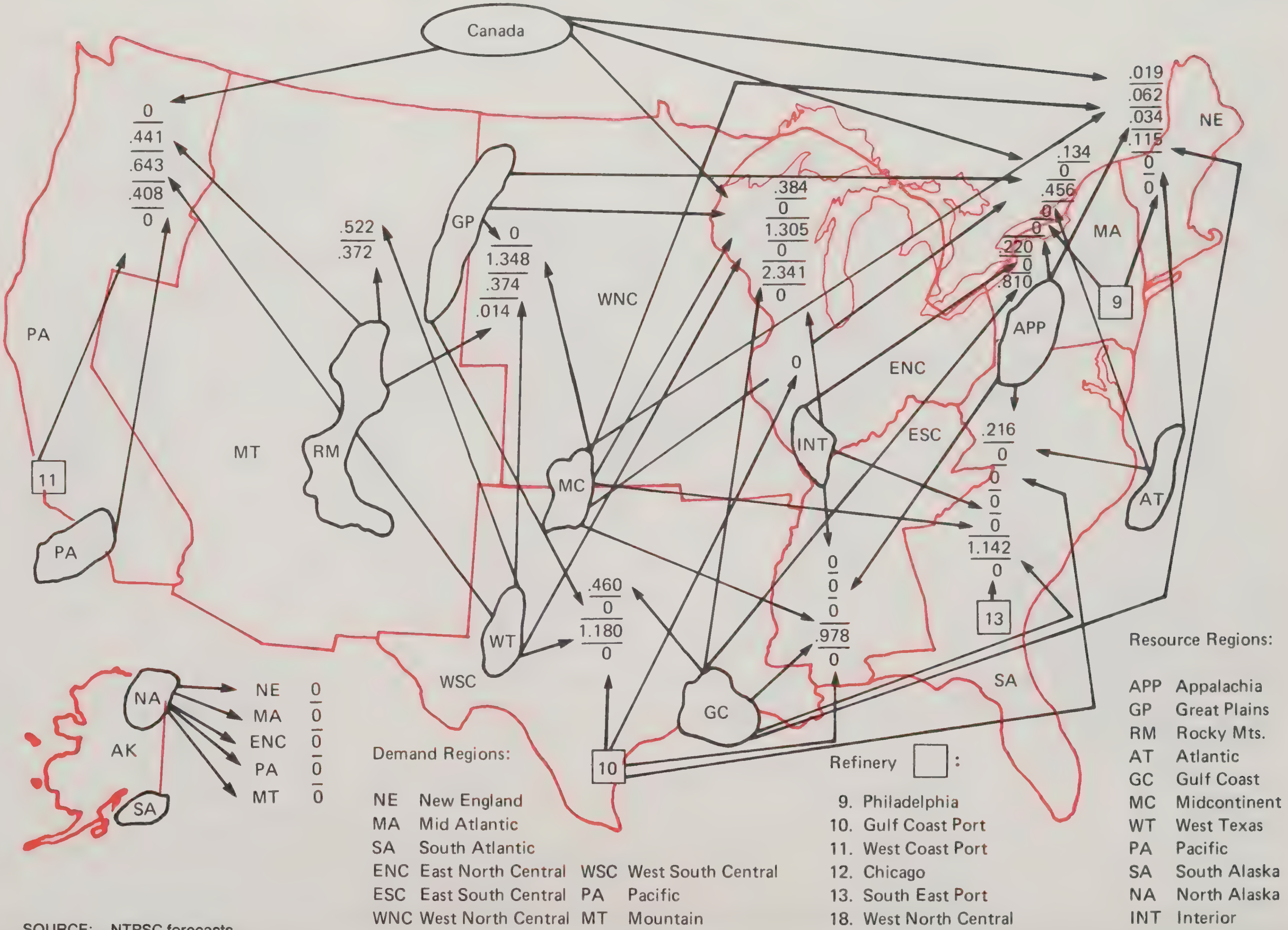

Canada
.115
.873
.173
.537
.086
.153
.777
.005
0
.729
.206
.614
.345
0
1.358
0
1.377
0
.010
0
.043
0
.177
.043
.657
.373
0
.177
.009
.024
.010
0
.038
.153
.206
0
0
.005
.547
.494
5.190
0
.647
.009
0
0
.010
1.045
0
PA
MT
WNC
ENC
ESC
MA
NE
SA
WSC
AK
GP
RM
MC
WT
INT
APP
AT
GC
NA
SA
PA
9
10
11
13
NE 0
MA .010
ENC .067
PA .010
MT 0
Demand Regions:
NE New England
MA Mid Atlantic
SA South Atlantic
ENC East North Central
ESC East South Central
WNC West North Central
WSC West South Central
PA Pacific
MT Mountain
Refinery ☐:
9. Philadelphia
10. Gulf Coast Port
11. West Coast Port
12. Chicago
13. South East Port
Resource Regions:
APP Appalachia
GP Great Plains
RM Rocky Mts.
AT Atlantic
GC Gulf Coast
MC Midcontinent
WT West Texas
PA Pacific
SA South Alaska
NA North Alaska

SOURCE: NTPSC forecasts


Canada
PA
MT
WNC
ENC
NE
MA
SA
ESC
WSC
AK
.029
.662
.024
.139
.014
.038
1.113
.374
.134
.038
.580
.057
.101
.293
.005
0
.259
.014
.005
.005
.019
.072
.537
.508
.019
.024
0
.005
.024
.254
.441
.019
.048
.029
.057
.528
.331
.019
0
.173
.341
.096
3.223
.101
1.309
.681
GP
RM
MC
WT
GC
INT
APP
AT
PA
NA
SA
9
10
11
13
NE .005
MA .125
ENC 2.091
PA 1.425
MT 0
Demand Regions:
NE New England
MA Mid Atlantic
SA South Atlantic
ENC East North Central
ESC East South Central
WNC West North Central
WSC West South Central
PA Pacific
MT Mountain
Refinery
9. Philadelphia
10. Gulf Coast Port
11. West Coast Port
12. Chicago
13. South East Port
18. West North Central
Resource Regions:
APP Appalachia
GP Great Plains
RM Rocky Mts.
AT Atlantic
GC Gulf Coast
MC Midcontinent
WT West Texas
PA Pacific
SA South Alaska
NA North Alaska
INT Interior

SOURCE: NTPSC forecasts.

APPENDIX FIGURE III–17. Inter-regional transport of natural gas, medium-growth scenario, 2000 (trillion cubic feet per year).


Canada
PA
MT
RM
GP
WNC
MC
WT
WSC
GC
INT
ENC
ESC
APP
MA
NE
AT
SA
AK
NA
SA
9
10
11
13
0
.441
.643
.408
0
.522
.372
0
1.348
.374
.014
.384
0
1.305
0
2.341
0
0
.134
0
.456
0
0
.220
0
.810
.019
.062
.034
.115
0
0
.216
0
0
0
0
1.142
0
.460
0
1.180
0
0
0
0
.978
0
NE 0
MA 0
ENC 0
PA 0
MT 0
Demand Regions:
NE New England
MA Mid Atlantic
SA South Atlantic
ENC East North Central
ESC East South Central
WNC West North Central
WSC West South Central
PA Pacific
MT Mountain
Refinery ☐:
9. Philadelphia
10. Gulf Coast Port
11. West Coast Port
12. Chicago
13. South East Port
18. West North Central
Resource Regions:
APP Appalachia
GP Great Plains
RM Rocky Mts.
AT Atlantic
GC Gulf Coast
MC Midcontinent
WT West Texas
PA Pacific
SA South Alaska
NA North Alaska
INT Interior

SOURCE: NTPSC forecasts.

Appendix IV
Government Accounts Computations

This appendix outlines the computation of the government accounts discussed in Chapter 11. Tables IV–1 through IV–10 list the line items included in the 1975 accounts. The references listed in the right-hand column are described in the section which follows the tables. The notes immediately follow each table.

New government programs and hence new line items may have come into being since 1975. Thus the government account tables in the text may contain line items not reported here. In similar fashion, some programs may have already ceased or be scheduled to cease. Too, the tables in the text may differ to the extent that line items for which government revenues and disbursements are expected to be roughly equal in the future have not been included in the tables in the text.

APPENDIX TABLE IV–1. Line items in government accounts, detailed air data, 1975 receipts (thousands of $)

			Market					
			Passenger		Freight			
Level of Gov't	Program	Total	Intercity	Internat'l	Intercity	Internat'l	Notes	References
Federal	Airport & Airway Trust Fund							
	Passenger Ticket Tax	778,766	778,766					R–1; p. 569
	Waybill Tax	53,999			53,999			R–1; p. 569
	Fuel Tax (General Aviation)	54,442	54,442					R–1; p. 569
	International Passenger Tax	55,273		55,273				R–1; p. 569
	Aircraft Use Tax	20,369	16,932	1,310	1,199	928	a,b,c,d	R–1; p. 569
	Tire & Tube Tax	880	597	108	99	76	a,b,c,d	R–1; p. 569
	Interest & Refunds	94,588	83,498	5,564	5,427	99	e	R–1; p. 569
	Washington Capital Airports (Est.)	20,000	17,556	452	1,846	146	f	R–1; p. 569
	Total Federal receipts	1,178,317	951,791	62,707	62,570	1,249		
State....................	Landing Fees & Misc. Charges	98,000	67,920	11,381	10,642	8,057	g	R–3; p. 18
	Total State Receipts	98,000	67,920	11,381	10,642	8,057		
Local....................	Landing Fees & Misc. Charges	920,000	637,616	106,844	99,895	75,645	g	R–3; p. 18
	Total Local Receipts	920,000	637,616	106,844	99,895	75,645		
	Total Government Receipts	2,096,317	1,657,327	180,932	173,107	84,951		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation,* prepared for the National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] Total amount allocated first between general and commercial aviation based on percentage distributions in R–2, p. 45.

[b] Commerical amount allocated between, passenger and freight based on revenue ton-miles in R–4; p. 1.

[c] General aviation is assumed to be entirely passenger.

[d] Intercity and international allocation based on revenue ton-miles in R–4, pp. 1, 4.

[e] Allocation based on distribution of all other fund receipts.

[f] Total amount allocated between passenger and freight based on weight of passengers and freight enplaned at Washington National and Dulles Airports as found in R–5, p. 51—one passenger equals 200 pounds. General aviation passenger receipts were estimated from the number of general aviation and air taxi landings at Dulles and National as found in R–24, and an estimated weighted average landing fee of $2.17. The landing fee is extrapolated from data in R–23, pp. 2–17 using a 6 percent inflation rate. Commercial passenger receipts are simply the difference between total intercity passenger receipts and general aviation receipts.

[g] The total amount is first distributed across general aviation, intercity commercial and international commercial, based on landing fees and other revenues obtained from the CAB. General aviation landing fees were estimated from total landings as obtained from R–24, and a weighted average landing fee of $2.17 extrapolated revenues were allocated to general aviation and commercial based on the percentage distribution found in the national airspace 10 year plan, R–10—37.4 percent general aviation and 62.6 percent commercial.

APPENDIX TABLE IV–2. Line items in government accounts, detailed air data, 1975 expenditures (thousands of $)

Level of Gov't	Program	Total	Market				Notes	References
			Passenger		Freight			
			Intercity	Internat'l	Intercity	Internat'l		
Federal	Civil Aeronautics Board							
	Regulation	17,437	11,500	1,701	3,031	1,205	a,b	R–1; p. 701
	Subsidy	63,581	58,151		5,430		c	R–1; p. 701
	National Mediation Board	669	381	100	110	78	d,e	R–1; p. 756
	National Trans. Safety Board	7,248	4,302	1,061	1,134	751	f,g,b	R–1; p. 759
	Appalachia Regional Devel. Prog.	2,700	2,581		119			R–1; p. 73
	DOC–NOAA	16,403	10,819	1,600	2,851	1,133	b,h	R–1; p. 211
	DOS–ICAO	4,873		2,853		2,020	b	R–1; p. 537
	Bilateral Agreements (Est.)	2,000		1,171		829	b	
	DOT–Office of the Secretary	12,954	7,380	2,125	1,945	1,504	i,b	R–1; p. 551
	FAA	1,640,751	1,376,558	34,665	204,985	24,543	j,k	R–1; p. 563
	Capital Airports	20,532	18,023	464	1,895	150		R–1; p. 563
	NASA–Aeor. Research & Tech.	312,892	178,234	51,338	46,975	36,345	b	R–1; p. 661
	Total Federal Expenditures	2,102,040	1,667,929	97,078	268,475	68,558		
State	Airport Programs	284,000	238,922	5,915	34,976	4,187	l,m,k	R–3; p. 20
	Total State Expenditures	284,000	238,922	5,915	34,976	4,187		
Local	Airport Programs	873,130	734,542	18,185	107,529	12,874	n,m,k	R–3; p. 20
	Total Local Expenditures	873,130	734,542	18,185	107,529	12,874		
	Total Government Expenditures	3,259,170	2,641,393	121,178	410,980	85,619		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation,* prepared for the National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] Intercity and international allocation based on aircraft revenue miles of certificated route carriers as shown in R–4, pp. 1 and 4, i.e., total—2,368,137,000 (p. 1 scheduled service + non-scheduled service); domestic—1,973,503,000 (p. 4, scheduled service + non-scheduled service); international—394,634,000.

[b] Passenger and freight allocations based on domestic and international revenue ton-miles from R–4; pp. 1 and 4, as summmarized below.

AIR REVENUE TON-MILES
(Thousands of $)

Geographic Market	Passenger	Freight	Total
Intercity	13,181,216	3,473,986	16,655,202
International	3,796,629	2,687,956	6,484,585
Total	16,977,845	6,161,942	23,139,787

[c] Passenger and Freight allocation based on revenue ton-miles of total local-service certificated-route air carriers, as tabulated in R–4, p. 7, i.e., passenger—1,060,390,000 (92 percent); freight—99,011,000 (8 percent); total local service—1,159,399,000 (100 percent).

[d] Expenses not directly assigned are equally distributed between rail and air, and factored by 0.998 for the actual outlay. That is, from a total of $3,125,000, $1,788,000 is directly assigned to rail. Air then gets 50 percent or $669,000 of the remaining $1,337,000.

[e] Total amount allocated according to revenue ton-miles as shown in note b, above.

[f] Of obligations, $5,587,000 is directly allocated to aviation, $1,063,000 to surface, and $2,404,000 is administrative. Allocating the administrative amount yields air—$7,607,000, and surface—$1,447,000. Surface then is arbitrarily divided equally between rail and highway, $724,000 each. The obligated amounts are reduced by 0.953 to get outlays.

[g] Domestic and international allocation based on distribution of U.S. Air accidents in R–7, p. 16, International—7 accidents (25 percent) and Domestic—21 accidents (75 percent).

[h] Expenditures for mapping, charting and surveying, plus administrative allocation totaled $34,137,000. Dividing equally between air and water yields $17,069,000. These amounts are reduced by a factor of 0.961 to get outlays.

[i] Expenses not directed to a specific mode are equally divided among modes. See below.

DOT GENERAL AND ADMINISTRATIVE EXPENSES
(Thousands of $)

Program	Total	Air	High	Pipe	Rail	Water
Off. of Sec.	40,094	6,059	6,059	6,059	*15,858	6,059
Trans. Plan., R&D	34,160	6,832	6,832	6,832	6,832	6,832
Grants, Gas Pipe Safety	1,167	—	—	1,167	—	—
Trans. Res. Overseas	215	43	43	43	43	43
	75,636	12,934	12,934	14,101	22,733	12,934

*Includes direct allocation to Regional Rail Reorganization (3,806) and Federal Railroad Administration (5,362).

The $12,934 in air expenditures is then allocated across submodes and markets using the distribution of FAA expenditures as developed in note j, below.

[j] The total amount includes the various expenditures shown in the table below, and excludes the amount allocated to public and military service.

FAA EXPENDITURES
(Thousands of $)

Type of Expenditure	Total	Public and Military	Commercial Air	General Aviation
Operations	$1,394,715	$308,412	$ 620,030	$466,273
Fac., Eng. & Dev.	8,648	8,648	—	—
Airport Grants	291,870	—	251,797	40,073
Fac. & Equip.	223,351	28,096	122,701	72,554
Res., Eng. & Dev.	63,612	8,226	39,849	15,537
SST & Safety	14,527	2,590	7,581	4,356
	$1,996,723	$355,972	$1,041,958	$598,793

Public and military and submodal allocations were based on the estimates contained in the 1977 Airport and Airways Cost Allocation Study (R–9, p. A–22). Intercity and international, and passenger and freight allocations were performed as shown in the following table.

ALLOCATED FAA EXPENDITURES
(Thousands of $)

	Total	Passenger	Freight
Total Federal	1,640,751		
Gen. Av.	598,793	598,793	
Total Comm.*	1,041,958		
Domestic**	982,750	777,765	207,985
Int'l.**	59,208	34,665	24,543

*See note j above.
**See note b above.

[k] The total commercial amount is allocated between intercity (domestic) and international based on number of departures found in R–5, pp. 3 and 4—4,534,870,000 (94.317 percent) domestic, and 273,214,000 (5.682 percent) international. Domesitc and intercity are then allocated across passenger and freight based on revenue ton-miles as shown in note b.

[l] State expenditures reflect a deduction of $82,000,000 in intergovernmental transfer payments as shown R–3, p. 20.

[m] The total amount is first allocated across submodes (general aviation and commercial) based on the NASP Ten-Year Plan, R–10, due to lack of better data equaling 62.6 percent commercial and 37.4 percent general aviation.

[n] Local expenditures reflect a deduction of $291,870,000 in Federal transfer payments (grants) from the Airport and Airway Trust Fund as shown in note j.

APPENDIX TABLE IV–3. Line items in government accounts, detailed highway data, 1975 receipts (thousands of $)

Level of Gov't	Program	Total	Market						Notes	References
			Passenger			Freight				
			Rural	Urban	Intercity	Rural	Urban	Intercity		
Federal...	Highway Trust Fund								a	R–6; p.V–6
	Motor Fuel Tax	4,442,000								
	Truck, Bux, Trailer Tax	231,000								
	Tire, Tube, Tread Tax	625,000								
	Truck Pts. & Acces'ry Tax	122,000								
	Lubricating Oil Tax	59,000								
	Some Vehicle User Taxes	220,000								
	Interest	603,000								
	Total Federal Receipts	6,302,000	520,811	1,607,018	1,511,576	952,311	301,239	1,409,045	b,c	
State.......	Bond Proceeds	1,412,000								R–6; p.V–6
	Investment & Other	538,000								R–6; p.V–6
	Tolls	1,052,000								R–6; p.V–6
	Other Taxes & Fees	220,000								R–6; p.V–6
	Subtotal	3,222,000	265,102	807,849	761,978	496,104	156,930	734,037	f,g	
	Motor Fuel & Vehicle Taxes	11,335,005	1,155,974	3,547,946	3,341,160	1,176,682	372,218	1,741,025	d,e	R–6; p.V–6
	Total State Receipts	14,557,006	1,421,076	4,355,795	4,103,138	1,672,786	529,148	2,475,062		
Local.......	Bond Proceeds	781,000								R–6; p.V–6
	Investment & Other	423,000								R–6; p.V–6
	Tolls	211,000								R–6; p.V–6
	Motor Fuel & Vehicle Taxes	207,000								R–6; p.V–6
	Parking Fees	120,000								R–6; p.V–6
	Other Taxes & Fees	167,000								R–6; p.V–6
	Total Local Receipts	1,909,000	157,070	478,642	451,464	293,936	92,979	434,909	h,i	
	Total Gov't Receipts	22,768,000	2,098,957	6,441,455	6,066,178	2,919,033	923,366	4,319,016		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation*, prepared for National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] Allocation of total amount is based on percentage distribution of FY 76 net revenues to the different items that comprise the Federal Highway Trust Fund as found in Tables FE–201 and HF–10 or R–6, pp. IV–8 and V–6 respectively, and as shown in the following table.

TRUST FUND RECEIPTS
(Millions of $)

	FY '76	Percent	Estimated 1975 Distribution
Excise Taxes:			
Motor Fuel	4,219	77.9	4,442
Tires	546	10.1	575
Innertubes	25	.5	26
Tread Rubber	23	.4	24
Trucks, Buses, Trailers	219	4.0	231
Federal Use	209	3.9	220
Lubricating Oil	56	1.0	59
Parts & Accessories	116	2.1	122
Subtotal	5,413	100.0	5,699
Interest	587		603
Total	6,000		6,302

[b] Passenger and freight allocation based on revenue percentage distribution for automobiles and buses (passenger), and single-unit trucks and combination trucks (freight) as contained in R–17, p. 14. Allocation of total trust fund receipts of $6,302 million as shown in the following table.

PASSENGER AND FREIGHT ALLOCATION OF TRUST FUND RECEIPTS
(Millions of $)

Service Type	Vehicle Type	Percent	Amount
Passenger	Autos	56.85	3,582,687
	Buses	0.90	56,718
Freight	Trucks	42.25	2,662,595
Total		100.00	6,302,000

[c] The allocations by vehicle type shown in note b were further allocated to geographical markets based on total vehicle-miles by vehicle type obtained from Table VM–1 in R–6, p. III–2, and a distribution of truck vehicle-miles and passenger vehicle-miles made by the NTPSC. The resulting vehicle-mile distribution is shown in the following table.

DISTRIBUTION OF HIGHWAY VEHICLE-MILES
(Millions of Miles)

Vehicle Type	Urban	Rural	Intercity	Total
Truck	31,051	98,162	145,241	274,454
Auto	461,594	152,706	436,172	1,050,472
Comm. Bus	*1,529		**1,120	2,649

*Obtained from R–11, p. 36. **Derived.

Results of applying the preceding distribution to trust fund receipts are shown in the following table.

GEOGRAPHICAL MARKET ALLOCATION OF TRUST FUND RECEIPTS
(Thousands of $)

Vehicle Type	Geographical Market Urban	Rural	Intercity	Total
Auto	1,574,289	520,811	1,487,487	3,582,587
Truck	301,239	952,311	1,409,045	2,662,595
Comm. Bus	32,729		23,989	56,718

[d] Allocation of motor fuel and vehicle revenues between passenger and freight is based on the distribution of gallons of fuel consumed. Buses, motorcycles and passenger vehicles are considered passenger while primary trucks are considered freight. See Table VM–1 in R–6, p. III–2.

[e] Total state motor fuel and vehicle revenues of $11,335 million are allocated between automobile, bus, truck in urban, rural, and intercity markets based on the distribution of vehicle miles (note c). Results are shown in the following table.

STATE FUEL AND VEHICLE TAXES
(Millions of $)

Vehicle Type	Urban	Rural	Intercity	Total
Auto	3,494,232	1,115,974	3,301,789	7,911,995
Comm. Bus	53,714		39,371	93,085
Truck	372,213	1,176,682	1,741,025	3,289,920

[f] Allocation of motor-vehicle, motor-carrier (other taxes) revenues is based on distribution as contained in Table MV–2 of R–6.

DISTRIBUTION OF MOTOR VEHICLE TAX RECEIPTS
(Millions of $)

Motor Vehicles	Amount	Percent
Auto, Cabs, & Motorcycles	2,093,960	
Buses	12,863	
Subtotal	2,106,823	56.95
Trucks, Trailers, Tractors	1,592,506	43.05
	3,699,329	100.00

[g] Urban, rural and intercity allocation is based on the vehicle miles distribution (note c). Results are shown below.

ALLOCATION OF ALL OTHER STATE RECEIPTS
(Millions of $)

	Urban	Rural	Intercity	Total
Auto	801,342	1,265,102	757,208	2,823,652
Bus	6,507		4,770	11,277
Truck	156,930	496,104	734,037	1,387,071

[h] Passenger and freight allocation is based on vehicle type distribution as contained in note f.

[i] Urban, rural, and intercity markets allocation is based on vehicle miles (note c). Results are shown below.

LOCAL TAX RECEIPTS OTHER THAN PROPERTY TAXES
(Millions of $)

	Urban	Rural	Intercity	Total
Auto	474,786	157,070	448,638	1,080,494
Bus	3,856		2,826	6,682
Truck	92,979	293,936	434,909	821,824

APPENDIX TABLE IV–4. Line items in government accounts, detailed highway data, 1975 expenditures (thousands of $)

			Market							
			Passenger			Freight				
Level of Gov't	Program	Total	Rural	Urban	Intercity	Rural	Urban	Intercity	Notes	References
Federal...	Interstate Commerce Comm.	23,074			1,296			21,778	b,c	R–1; p. 748
	National Trans. Safety Board	690			39			651	d,c	R–1; p. 759
	DOT–Office of the Secretary	12,954			7,837			5,117	e,c	R–6; p. 551
	Highway Construction[a]	7,288,000	736,317	2,237,907	2,112,071	787,468	249,095	1,165,142	f	R–6; p. V–6
	Total Federal Expenditures	7,324,718	736,317	2,237,907	2,121,243	787,468	249,095	1,192,688		
State.......	Const, Oper, Maint, Other	15,133,000	1,528,909	4,646,851	4,385,561	1,635,120	517,228	2,419,331	f	R–6; p. V–6
	Total State Expenditures	15,133,000	1,528,909	4,646,851	4,385,561	1,635,120	517,228	2,419,331		
Local.......	Const, Oper, Maint, Other	5,732,000	579,112	1,760,110	1,661,141	619,342	195,913	916,382	f	R–6; p. V–6
	Total Local Expenditures	5,732,000	579,112	1,760,110	1,661,141	619,342	195,913	916,382		
	Total Gov't Expenditures	28,189,718	2,844,338	8,644,868	8,167,945	3,041,930	962,236	4,528,401		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation,* prepared for National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] Includes Highway Trust Fund Monies tranferred to FHWA by other agencies and expended by FHWA, and funds expended by other agencies as shown in R–6; p. VI–4.

[b] Total outlay of $46,146,000 is equally divided between rail and highway in accordance with GAO allocation in R–12, Appendix II, p. 78.

[c] Passenger and freight allocation is based on cost percentage distribution for automobiles and buses (Passenger), and single unit trucks and combination trucks (Freight) as specified in R–17, p. 14—1,259 (5.616 percent) passenger and 21,156 (94.384 percent) freight.

[d] BTSB directly allocates $l,063,000 to surface-accident and safety investigation as contained in R–1, p. 59. When administrative cost is included it becomes $1,447,000. This amount is equally divided between rail and highway modes ($724,000 each) and factored by 0.953 to obtain outlays.

[e] The total amount is derived according to note i under Appendix Table IV–2. Allocation is proportional to the FHWA allocation across submodes and markets.

[f] The total amounts for Federal, state and, local expenditures consist of the amounts shown in the following table.

GOVERNMENTAL HIGHWAY EXPENDITURES
(Millions of $)

Level of Gov't	Construction	Maintenance, Admin., Other	Total
Federal	6,987	301	7,288
State	7,954	7,179	15,133
Local	680	6,412	7,092
Total			29,513

Maintenance and other expenditures were obtained directly from Table HF–10 in R–6, p. V–6, while construction expenditures were derived from the same source by accounting for intergovernmental transfers as shown in the following table.

INTERGOVERNMENTAL HIGHWAY EXPENDITURE TRANSFERS
(Millions of $)

			Local		
Type of Expenditure	Federal	State	Total	County	Municipal
Direct Construction Expenditure	332	11,011	2,918		
Intergov'tl Transfers	5,623	(5,616)	(7)	(3)	(4)
	1,032	(271)	(761)	(454)	(307)
		2,814	(2,814)	(1,752)	(1,062)
		219	(219)	(126)	(93)
		(101)	101	192	(91)
		(102)	102	(2)	104
Total—Indirect Construction Expenditures	6,987	7,954	(680)		

The total (construction plus maintenance and other) expenditures are allocated across geographical and use markets and across submodes based on procedures and data developed in the 1965 and 1969 Highway Cost Allocation studies and on miles traveled by various vehicle types in 1975. The first step in this allocation process is to obtain the direct construction expenditures in terms of road class from Table HF–221 in R–16, p. 143, as shown in the table below.

DIRECT CONSTRUCTION EXPENDITURES BY ROAD CLASS
(Millions of $)

	Level of Government		
Road Class	Federal	State	Local
Interstate	—	3,733	—
Other ABC	—	5,795	525
Other State	—	1,149	—
Other Local Roads	332	294	2,393
Total	*332	10,971	2,918

*This amount is from R–6, p. V–6. It differs by $18 million from the $314 million shown in R–16, p. 143. The difference is negligible in the final results.

The above expenditures are then allocated among "common" expenditures due to all three highway submodes and trucks and buses using percentage estimates derived from R–18, p. 40. Results are shown in the following table.

DIRECT CONSTRUCTION EXPENDITURES BY ROAD & WEIGHT CLASS
(Thousands of $)

		Level of Government					
		Federal		State		Local	
Road Class	% of Exp. that Are Common	Common	Trucks & Buses	Common	Trucks & Buses	Common	Trucks & Buses
Interstate	74.4	—	—	2,807,112	965,888	—	—
Other ABC	75.0	—	—	4,346,250	1,448,750	393,750	131,250
Other State	75.0	—	—	861,750	287,250	—	—
Other Local	80.4	266,928	65,072	236,376	57,624	1,923,972	469,028
Totals		266,928	65,072	8,251,488	2,759,512	2,317,722	600,278

The common expenditures in the table titled "Direct Construction Expenditures by Road & Weight Class" and the maintenance and other expenditures from the first table were then split among automobiles, trucks and buses, and the truck and bus expenditures were split into their separate categories using vehicle-miles as obtained from Table VM–1 in R–6, p. III–2, and shown in the table below.

VEHICLE MILES TRAVELED
(in Millions)

Vehicle Submode	Miles	Percent	Percent
Automobile	1,050,472	79.1271	
Bus	2,648	00.1995	00.9556
Truck	274,454	20.6734	99.0444
Total	1,327,574	100.0000	100.0000

Results of applying these distributions to the preceding expenditures are shown in the table below.

SUBMODAL HIGHWAY EXPENDITURES AFTER TRANSFER PAYMENTS

(Thousands of $)

Level of Gov't	Type of Expenditure	Total	Automobile	Bus	Truck
Federal	Common Const.	266,928	211,212	533	55,183
	Truck & Bus Const.	65,072		622	64,450
	Maint. & Other	301,000	238,181	602	62,217
State	Common Const.	8,251,488	6,529,171	16,458	1,705,859
	Truck & Bus Const.	2,759,512		26,370	2,733,142
	Maint. & Other	7,179,000	5,680,743	14,358	1,483,899
Local	Common Const.	2,317,722	1,833,949	4,622	479,151
	Truck & Bus Const.	600,278		5,736	594,542
	Maint. & Other	6,412,000	5,073,816	12,824	1,325,360
Total		28,153,000	19,567,072	82,125	8,503,803
Percent		100.000	69.503	00.292	30.205

The bottom line from the preceding table was then used to distribute Federal, state and local total expenditures across submodes. Results are shown in the table below.

SUBMODAL HIGHWAY EXPENDITURES BEFORE TRANSFER PAYMENTS

(Thousands of $)

Level of Gov't	Total Amount	Automobile	Bus	Truck
Federal	7,288,000	5,065,160	21,135	2,201,705
State	15,133,000	10,517,435	43,886	4,571,679
Local	5,732,000	3,983,740	16,623	1,731,637

The automobile and bus amounts are distributed over the geographical segments on the passenger market, and the truck amount is distributed over the segments of the freight market based on a distribution of vehicle miles developed by the NTPSC and shown below.

GEOGRAPHICAL DISTRIBUTION OF VEHICLE-MILES

(Millions of $)

Type of Vehicle	Units	Urban	Rural	Intercity	Total
Automobile	Miles	461,594	152,706	436,172	1,050,472
	Percent	43.942	14.537	41.521	100.000
Bus	Miles	1,528		1,120	2,648
	Percent	57.704		42.296	100.000
Truck	Miles	31,051	98,162	145,241	274,454
	Percent	11.314	35.766	52.200	100.000

APPENDIX TABLE IV–5 Line items in government accounts, detailed pipeline data, 1975 (thousands of $)

Level of Gov't	Program	Total	Intercity Freight Market	Notes	References
Receipts					
Federal	Nil				
State	Nil				
Local	Nil				
Expenditures					
Federal	Federal Power Commission (GAS)	11,839	11,839	a	R–1; p. 735
	DOI—Geological Survey: Alaska Pipeline Investigation	251	251	b	R–1; p. 462
	DOT—Office of the Secretary, etc	14,121	14,121	c	R–1; p. 551
	Total Federal Expenditures	26,211	26,211		
State	Nil				
Local	Nil				
	Total Government Expenditures	26,211	26,211		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation,* prepared for National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] Total amount includes total gas pipeline regulation cost ($10,535,000) plus proportionate share of administrative cost ($816,000), i.e., ($10,535,000) × $2,498,000) ($34,731,000–$2,498,000) then factored by 1.043 to get outlay.

[b] Authorized amount ($346,000) is factored by 0.726 to get to outlay ($251,000).

[c] See note i under Appendix Table IV–2.

APPENDIX TABLE IV–6. Line items in government accounts, detailed rail data, 1975 receipts (thousands of $)

Level of Gov't	Program	Total	Intercity Freight Market	Notes	References
Federal	Alaska Railroad	42,286	42,286	a	R–1; p. 591
	Total Federal Receipts	42,286	42,286		
State	Nil				
Local	Nil				
	Total Government Receipts	42,286	42,286		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation,* prepared for National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] Amount entirely allocated to freight. Passenger revenue only accounts for 2 percent of total.

APPENDIX TABLE IV–7. Line items in government accounts, detailed rail data, 1975 expenditures (thousands of $)

			Market				
			Passenger		Freight		
Level of Gov't	Program	Total	Urban	Intercity	Intercity	Notes	References
Federal	Interstate Commerce Commission	23,074		947	22,127	b,c	R–1; p. 748
	National Mediation Board	2,452		101	2,351	d,c	R–1; p. 756
	National Trans. Safety Board	690		28	662	e,c	R–1; p. 759
	U.S. Railway Association	22,700			22,700		R–1; p. 805
	DOS–Pan Amer. Congress Assoc.	15			15	f	R–1; p. 537
	DOT–Office of the Secretary	22,753		933	21,820	g,c	R–1; p. 551
	Fed. Rail. Administration						
	General, Safety, R&D	63,859		2,620	61,239	c	R–1; p. 586
	Rail Service Assistance[a]	169,004			169,004		R–1; p. 586
	Amtrak	299,000		299,000			R–1; p. 586
	Alaska Railroad	43,684			43,684		R–1; p. 586
	Disaster Relief	2,046			2,046		R–1; p. 586
	Total Federal Expenditures	649,277		303,629	345,648	g	
State	Payments to Amtrak (Section 403B)	3,700		3,700			
	Total State Expenditures	3,700		3,700			
Local	Nil						
	Total Government Expenditures	652,977		307,329	345,648		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation*, prepared for National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] Includes aid to Penn Central Railroad.

[b] ICC's total outlay of $46,148,000 is equally divided between rail and highway based on GAO allocation in R–12, p. 78.

[c] Passenger and freight allocation is based on percentage distribution of ICC Regulated Carriers revenues in domestic operations in R–13, p. 6—$16,573,000,000 (95.897 percent) freight and $709,000,000 (4.103 percent) passenger.

[d] National Mediation Board directly assigned $1,788,000 to rail. Another $1,337,000 is equally shared between rail and air. When factored by 0.998, rail's outlay becomes $2,452,000.

[e] Rail's share of direct allocation to surface, including administration, is $724,000. When factored by 0.953, it becomes the outlay.

[f] Due to lack of information on international operation the amount is entirely allocated to intercity freight.

[g] Total amount includes direct allocation to Regional Rail Reorganization ($3,806,000) and Federal Railroad Administration ($5,362,000) by DOT, Office of the Secretary in R–1, p. 551. The sum of $9,168,000 is factored by 1.0678 to obtain outlays. To that product is added an equal share of the outlays remaining in the Office of the Secretary and outlays for Transportation Planning, Research, and Development, and for Transportation Research Activities Overseas. See note i under Appendix Table IV–2.

[h] Amount based on data by Mr. Julius Ganoza of the Rail Passenger Program Division of the FRA.

APPENDIX TABLE IV–8. Line items in government accounts, detailed water data, 1975 receipts (thousands of $)

Level of Gov't	Program	Total	Market				Notes	References
			Passenger		Freight			
			Intercity	Internat'l	Intercity	Internat'l		
Federal	Panama Canal							
	User Charges	169,266			5,078	164,188	a	R–1; p.318
	Other	84,495			2,535	81,960	a	R–1; p.318
	Saint Lawrence Seaway	6,252			188	6,064	b	R–1; p.596
	Total Federal Receipts	260,013			7,801	252,212		
State	Alaska Ferry System	13,088	6,544		6,544		c	R–19; p. 7
	Ports & Terminals	131,000	891	419	72,959	56,731	d,e	R–3; p. 18
	Total State Receipts	144,088	7,435	419	79,503	56,731		
Local	Ports & Terminals	325,000	2,209	1,041	181,007	140,743	d,e	R–3; p. 18
	Total Local Receipts	325,000	2,209	1,041	181,007	140,743		
	Total Government Receipts	729,101	9,644	1,460	268,311	449,686		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation,* prepared for National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] All receipts are allocated to international except for 3 percent that is based on tonnage hauled as contained in R–20, p. 111.

[b] All receipts are allocated to international except for 2 percent that is based on tonnage domestically hauled as contained in R–20, p. 111.

[c] Receipts are equally allocated between intercity passenger and intercity freight in the absence of better information.

[d] Passenger and freight allocation is based on revenue data found in R–7, p. 27:99 percent freight and 1 percent passenger.

[e] Domestic and international allocation based on percentage distribution of millions of tons of freight hauled—foreign 7,641 (43.74 percent) and domestic 9.827 percent) in 1974 as contained in R–22.

APPENDIX TABLE IV–9. Line items in government accounts, detailed water data, 1975 expenditures (thousands of $)

			Market					
			Passenger		Freight			
Level of Gov't	Program	Total	Intercity	Internat'l	Intercity	Internat'l	Notes	References
Federal	Federal Maritime Commission	7,250			4,079	3,171	a	R–1; p.733
	TVA–Navigational Channel	12,070			12,070			R–1; p.796
	DOC–NOAA	9,290	4,477		2,707	2,106	b,a,c	R–1; p.211
	MARAD–Ship Construction	240,828				240,828		R–1; p.222
	Operating Subid.	243,152				243,152		R–1; p.223
	Other	59,392			33,414	25,978	d,a	R–1; p.224
	DOD–Corps of Engineers	687,203	7,719		536,478	143,006	e,f	R–1; p.300
	Panama Canal	261,252			7,838	253,414	g	R–1; p.318
	DOS–Intergov. Mar. Org.	152				152		R–1; p.537
	Bilateral Negotiations	2,000				2,000		R–1; p.537
	DOT–Office of the Secretary	12,954			7,288	5,666	h,a	R–1; p.551
	Coast Guard	523,330	252,195		152,541	118,594	i,b,a	R–1; p.555
	Saint Lawrence Seaway	4,874			97	4,777	j	R–1; p.595
	Total Federal Expenditures	2,063,747	264,391		756,512	1,042,844		
State	Alaska Ferry System	28,766	14,383		14,383		k	R–19; p.38
	Ports & Terminals	212,000	1,441	679	118,078	91,802	l,m	R–3; p.21
	Total State Expenditures	240,766	15,824	679	132,461	91,802		
Local	Ports & Terminals	529,973	3,603	1,697	295,196	229,504	l,m	R–3; p.21
	Total Local Expenditures	529,973	3,603	1,697	295,196	229,504		
	Total Government Expenditures	2,834,486	283,818	2,376	1,184,142	1,364,150		

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation,* prepared for National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] The international and intercity allocation is based on the distribution of tons hauled, 43.74 percent international (foreign) and 56.26 percent intercity (domestic) occurring in 1974 and found in R–22.

[b] Total is derived from mapping, charting and surveying expenditures of $32,386,000 for operations, plus $62,000 in capital outlays, plus $1,689,000 in administrative expensives (a proportionate share of the $21,991,000 listed). This amounts to $34,137,000 which is then equally divided between air and water and factored by 0.961 to obtain the NOAA outlay. Total resulting amount is further reduced by $7,113,000—the amount allocated to the military based on the military use percentage of 43.365 percent obtained from R–15, p. 69.

[c] Passenger and freight allocation was based on the Coast Guard cost allocation of 48.19 percent passenger (recreational) and 51.81 percent freight (commercial) shown in R–15, p. 69.

[d] The total amount includes $26,109,000 in R&D expenditures plus $33,283,000 in operating expenditures. Operating expenditures are derived from the $43,771,000, shown in R–8, p. 224, less $7,009,000 for national security support capability ($4,738,000 + administrative cost of $2,269,000). The result os $36,764,000. When factored by 0.905 to obtain the outlay estimate, the result is $33,283,000.

[e]The total amount is derived as shown in the following table.

CORPS OF ENGINEERS EXPENDITURES
(Thousands of $)

Const., Gen. (Nav. Related)	$ 66,407		
	141,981		
	8,144		
	40		
Subtotal	$216,572		
Common Portion			
Adv. Eng. Design	$ 22,055		
Var. Mult. Purp. Power (Locks)	62,355		
Employee Comp.	1,870		
Reimb. Prog.	14,717		
Subtotal	$100,997		
	(1) × 0.23532		
Allocated to Nav.	23,767	$ 23,767	
Subtotal		$240,339	
		(2) × 1.11103	
Outlay		$267,024	$267,024
Ops. $ Maint., Gen. (Nav. Related)		$254,833	
		79,302	
		27,966	
Subtotal		$362,101	
		(30) × 1.04388	
		$377,990	$377,990
Gen. Investig. Outlay (Including R&D)		$ 69,824	
		(4) × 0.39595	
Amount Allocated to Nav.		$ 27,647	$ 27,647
Gen. Expense Outlay		$ 41,606	
		(5) × 0.34949	
Amount Allocated to Nav.		$ 14,541	$ 14,541
Total			$687,202

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(1)Navigation Specified Oblig./(Tot. Oblig. – Common Portion) = $216,572/($1,021,290 – $100,977) = 0.23532.

(2)Tot. Outlays/Tot. Oblig. = $1,134,893/$1,021,290 = 1.11103.

(3)Tot. Outlays/Tot. Oblig. = $522,109/$500,159 = 1.04388.

(4)(Nav. Port., Gen. Const. Oblig. + Nav. Port., Gen., O&M Oblig.)/(Tot. Gen. Const. Oblig. + Tot. Gen. O&M Oblig.) = ($240,324 + $362,101/($1,021,290 + $500,159) = o.39595.

(5)Tot. Nav. Oblig./(Tot. COE Oblig. – Gen. Expense Oblig.) = ($240,339 + $362,101 + $66,668 × 0.39595)/($1,839,351 – $40,083) = 0.34949.

[f]Allocation based on percentage distribution of Corps subsidies in R–15, p. 79.

[g]All but 3 percent of expenditures are allocated to International based on tons hauled as shown in R–20, p. 111.

[h]Total amount is waterway share in the remainder of administrative costs, after direct allocation, which is equally divided among the five modes, as shown in note i under Appendix Table VI–2.

[i]Total amount excludes $400,721,000 allocated to the military based on distribution in R–14, p. 69. The total in thousands of dollars and military expenses is as follows:

Operating Expenses	652,273
Acquisition, Construction & Improvements	106,110
Alternation of Bridges	4,813
Retirement Pay	104,875
Reserve Training	28,207
R&D	16,087
State Boating Safety Assistance	4,944
Pollution Fund	6,742
Total	924,051

[j]All but 2 percent of expenditures are allocated to international based on tonnage hauled as contained in R–20, p. 111.

[k]Expenditures are equally allocated between passenger and freight in the absence of other information.

[l]Passenger and freight allocation based on distribution of national marine transportation bill as shown in R–21, p. 253—approximately 99 percent freight and 1 percent passenger.

[m]Intercity and international passenger allocation based on distribution of revenue passenger-miles as shown in R–13, p. 18: 67.92 percent intercity and 32.02 percent International.

APPENDIX TABLE IV–10. Line items in government accounts, detailed urban mass transportation data, 1975 (thousands of $)

Receipts Level of Gov't	
Federal	Nil
State	Nil
Local	Nil

Expenditures Program	Total	Market						Notes	References
		Passenger			Freight				
		Rural	Urban	Intercity	Rural	Urban	Intercity		
UMTA (Bus)	270,590		270,590					a	R–6; p. 593
Wash Metro Trans Authority	175,306		175,306						R–1; p. 746
UMTA (Rail)	482,656		482,656					c	R–1; p. 593
Total Federal	928,552		928,552						
Transit Assist. (Bus)	303,868		303,868					b	R–6; p. V–6
Transit Assist. (Rail)	105,757		105,757						R–11; p. 26
Total State	409,625		409,625						
Transit Assist. (Bus)	518,857		518,857					d	R–11; p. 26
Transit Assist. (Rail)	180,581		180,581						R–11; p. 26
Total Local	699,438		699,438						
Grand Total	2,037,615		2,037,615						

SOURCE: MITRE Corporation, *Government Financial Involvement on Transportation,* prepared for National Transportation Policy Study Commission, McLean, Va.: October 1973.

[a] Total amount is derived from distribution of Federal outlays of $753,246,000 in R–4, p. 593. Allocation across bus and rail is based on administrative reservations for UMTA programs in R–15, p. 86: 35.923 percent bus and 64.077 percent rail.

[b] Total amount is derived from total state operating assistance of $409,625,000 obtained from R–11, p. 24.

[c] Allocation across bus and rail is based on distribution of bus and rail passengers as obtained from R–38, p. 24.

[d] Total amount is derived from total local operating assistance of $699,438,000 obtained from R–11, p. 26.

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Appendix V
Mechanisms for Policy Development and Acceptance

INTRODUCTION

A description of the general approaches of previous studies and the specific method adopted by the NTPSC for its study provides supplementary information to the discussion of NTPSC policy proposals and their impacts. The selective (and sometimes biased) modal orientation of preceding studies is in contrast with the NTPSC's concern for a balanced approach based on the urban, rural, intercity and international markets. Further, the contrast between the frequently historical orientation of other studies and the emphasis on the future by the NTPSC is noted. Not only these contrasts, but the specific method followed by the Commission in its policy development is described, first in a summary fashion and then in detail.

APPROACHES OF PAST STUDIES

The study of national transportation policy is hardly a new endeavor. Since at least 1808, Federal officials and other interested parties have frequently investigated both the Federal government's role in transportation and the effects of transportation on other national policies. The history of the process and products of these numerous policy investigations reveals the evolution of national transportation issues and the responses of the Federal government through its policies and programs. Reviewing these investigations provided a wealth of experience with formats, content and methodology to guide NTPSC's study.

As might be expected, approaches in past studies usually reflect prevailing socio-political attitudes and the contemporary weaknesses of and conflicts in the U.S. transportation system. Most of the NTPSC's current issues and all of its goals have emerged and sometimes receded throughout the 170-year history of past investigations; however, NTPSC's simultaneous emphasis on as many issues and goals appears to be unprecedented. In particular, the rural passenger market and the concurrent goals of environment, energy and equity are new to truly comprehensive transportation policy studies.

Most of the studies reviewed by the NTPSC reflect attempts to solve specific contemporary problems plaguing the nation's transportation system, rather than to maximize the potential of that system. The relatively few large-scale studies which are more forward-looking were written either when the goals and responsibilities of the Federal government were expanding, or when a new mode was just appearing on the scene. Expanding goals are illustrated by the 1942 report of the National Resources Planning Board,[1] which reflected the focus of the preceding decade on social goals and issues. While contemporary goals were generally recognized in past studies, only the more recent policy investigations and statements have emphasized the *process* of policy and goal formulation.

Most past studies were organized by mode. Markets were usually recognized only as a restriction on the study's scope. While a modal format is less likely to capture gaps and conflicts in the nation's multimodal system of transportation, it reflects the components of the system and is easy to follow. However, some of the more significant failures of U.S. transportation likely were caused by the modal organization of policies and institutions. The traditional approach of organizing transportation studies by mode tends to perpetuate conflict rather than coordination, particularly with respect to impediments to intermodalism. Unfortunately, no simple organization completely captures the interactions and conflicts in the unstructured policymaking system. Classifying policies by function (i.e., regulation, finance, planning and operation) tends to understate temporal and geographic variation. Using agencies or branches of government as classifying mechanisms misses their conflicting policies and redundant programs. Even NTPSC's market approach may tend to overlook bottlenecks and failures in coordination between markets.

While most policy findings and recommendations have been made in the context of a specific goal and transportation mode, several published statements have had a direct and significant bearing on all modes and on all four markets. The issue of "balanced transportation policy" has been repeated frequently and vociferously for more than seven decades. Differing regulatory and promotional policies among the modes have been traditional rationales for countless requests for:

1. Increasing subsidies and other forms of financing assistance to the represented modes;

2. Decreasing user charges borne by the represented modes;
3. Decreasing financial assistance and/or increasing user charges to competing modes;
4. Changing rate structures;
5. Changing degrees of regulatory restrictions; and
6. Changing policies which affect the demand for services, such as user-side subsidies.

The question of balanced policy among the modes has also been the motivating force in nearly all policy studies since World War I. Notable examples include the reports of the Federal Coordinator of Transportation,[2] the Board of Investigation and Research[3] and the Congressional Research Service[4] each of which compares for all modes the amount and impact of Federal dollars and regulations. None of the truly comprehensive studies makes unqualified conclusions.

An obvious goal of recommendations for balanced policy is equity, yet more often the underlying goals include several of NTPSC's remaining ten (see Table 107). The goals of adequate service and appropriate rates and prices, expressed in early studies such as the 1874 Windom Report[5] and the 1886 Cullom Report[6] have been more recently supplemented by economic efficiency and energy as can be seen in the 1961 Doyle Report,[7] and the 1977 Senate Commerce Committee's *Intercity Domestic Transportation System for Passengers and Freight*.[8] Industry promotion and protection have usually accompanied recommendations for balanced policy among the modes, which suggests that many recommendations for "balance" might be implicit attempts to maximize a given mode's share of benefits provided or induced by the Federal government. In any event, the concern with "balanced" policy has increased over the years, as has Federal involvement in transportation.

The content of policy (balanced or otherwise) is influenced by the methods of and the institutions for policymaking. As a consequence, increased concern with balanced policy has been matched by the attention given to the rationalization of Federal involvement in transportation. (Rationalization in this context means to make orderly and explicit.) These recommendations usually include:

1. The creation of an explicit planning process;
2. The development of explicit goals and objectives; and
3. The public evaluation of alternative courses of action and the potential impacts, both direct and indirect, of each.

According to these recommendations, a rationalized policymaking process requires appropriate bureaucratic structures as well as reformed policymaking procedures. Key issues in developing an effective institutional framework include:

1. Centralization versus decentralization;
2. The combination or separation of promotional and regulatory functions; and
3. Agency organization along modal, market, goal or other functional lines.

SUMMARY OF THE NTPSC POLICY DEVELOPMENT PROCESS

A crucial task in fulfilling the NTPSC mandate was to develop recommended policies for resolving current and emerging transportation issues to the year 2000. These issues were identified through a series of public hearings, surveys, searches of published reports and statements, forecasts, and an analysis of existing policies and programs. The issues were then consolidated into fundamental categories. The process by which policies for resolving these issues were developed and analyzed by the NTPSC is discussed in the following sections.

Each step of the policy development process involved teams whose members reviewed existing conditions, proposed changes and analyzed impacts. Suggested policies were divided among two alternatives for resolving a given transportation issue. One alternative (termed "Net Benefits") sought primarily to apply free market principles for an efficient solution to the issue. This alternative emphasized pricing mechanisms which reflect incremental economic and social costs, and used the marketplace to yield maximum public benefits. In the other approach (termed "Values"), although the marketplace was accepted as a tool to maintain progress toward established goals other than efficiency, it was believed that the market-place should be redirected. In other words, the Values alternatives emphasized goals other than economic efficiency. The eleven goals listed in Table 107 were used in all three alternatives. Specifically, impacts of status quo, Net Benefits, and Values policies were reported for all of the eleven goal areas, wherever possible.

Policy development teams were organized by intercity, urban, rural and international markets. Each participant was assigned one or more issues relevant to the team's market, then asked to document the existing objectives, policies and programs (and their impacts) for the given issue, and to propose objectives, policies and programs (and their potential impacts) for the Net Benefits and Values alternatives. Findings and proposals were discussed by the *issue teams,* and opinions were recorded. Each group met a second time to refine its previous individual policy recommendations and to mold them into two consistent and comprehensive policy packages for each market. Again, impacts were analyzed using the eleven goals and a *market team* consensus was documented. The findings and recommendations were then reviewed by staff not heavily involved in the earlier reports and meetings. This *small review team* considered the alternative policies and impact analysis and offered suggestions for improvement.

Selected representatives from the *issue teams* and the *market teams* were assembled as a *national team* at the next step in the process to consider status quo policies and to devise a Net Benefits set and a Values set of national transportation policies. These sets, together with objectives and impacts, were next subjected to review by a larger, independent review team. Detailed reports for each market and for the U.S. as a whole were drafted by staff to reflect the work of the several teams and subjected to the scrutiny of NTPSC staff directors.

At this point, the modified proposals were presented to the Commissioners themselves. Throughout the lengthy process, from initial issue meetings through final Commission recommendations, the Commissioners were informed of progress and shared access to the written materials. While none of the Commissioners became actively involved in each policy development meeting, the staff process provided them with a structure to use in their policy debate. Commissioners had the option of choosing a complete set of Net Benefits or of Values alternatives, or of picking and choosing among them. They had the further options of proposing policies not considered by staff, or of retaining status quo policies. The staff process of building alternative policy sets and tracing impacts enabled rapid consideration of these new proposals. The purpose of the staff process was to provide the Commissioners with enough structure to facilitate their deliberations without constraining their choices; to provide concrete evidence on the impacts of policy proposals; and to illustrate the vital importance of developing consistent sets of market and national policies.

A DETAILED DESCRIPTION OF NTPSC's POLICY DEVELOPMENT PROCESS

Key transportation issues were derived through the simultaneous efforts of several NTPSC staff groups. One group searched the transportation literature, surveyed individuals and groups, and evaluated public hearings to help determine key transportation issues.[9] Another inventoried existing transportation policy and programs, and identified issues arising from gaps and conflicts among these.[10] A third group developed scenarios and forecasts to seek issues that will emerge from now to the year 2000. Together, the groups identified key U.S. transportation issues, and organized these by markets (intercity, urban, rural and international) rather than by mode. The assignment of issues to markets is listed in Appendix Table V–1. Public input and review was provided from many sources.

New NTPSC teams were created to study issues for each market. These *issue teams* were supplemented by representatives from selected universities. The issues studied by the teams arose from inappropriate or short-sighted Federal policy, overlapping Federal efforts, or no Federal policy where policy was needed. For example, the issue of proliferation of government agencies, policies, and programs was addressed. Some issues (finance, public versus

APPENDIX TABLE V–I. Issues assigned to market teams

I. *Regulation Issues*

Regulatory reform, including rail, motor carrier, and air carrier regulation.
Government standards for transportation.
Competition among transportation modes.
Rail abandonment.
Labor-management relations.
Mobility rights and transport as a social service.
Transport and the environment.
Energy supply and conservation.
Intermodalism and common ownership.
Truck size and weight regulations.
Hazardous materials transport.
Accident reduction.
Buy American.

II. *Ownership & Operations Issues*

Public vs. private ownership.

III. *Finance, Pricing and Taxation Issues*

Government Finance.
Public vs. private capital formation.
Maintenance reapir and upgrading of highways.
Maritime Trade support.
Regional and community development through transportation.
Stimulation of employment through transportation.

IV. *Planning and Information*

Transportation planning assistance.
Research, development and demonstration.
Critical materials supply.
Urban goods movement.

V. *Governmental Organization Issues*

Consolidation of transport regulatory agencies.
Proliferation of government agencies, policies and programs.

private capital formation, and energy supply and conservation) were assigned to all market teams, while others (e.g., critical materials supply, maritime trade support, truck size and weight) were assigned to only one market team. In the course of discussion, additional issues were defined, and each team debated a range of issues not initially assigned.

Each participant on an issue team was assigned one or more issue(s) to analyze, using a common structure. For each issue, the structure consisted of an:

1. Identification of the status quo objectives of transportation policy (which rarely appear in the statutes or administrative code in explicit form);
2. Identification of status quo policies and related programs;
3. Analysis of impacts of status quo policy, reported for each of eleven goal areas;
4. Statement of proposed Net Benefits objectives to treat the issues (in which efficiency-oriented, market-based objectives are emphasized);
5. Statement of proposed Net Benefits policies to accomplish the Net Benefits objectives, and, in so doing, to resolve the issues being discussed;
6. Statement of proposed Values objectives to treat the issues (in which one or more goals other than efficiency receive primary consideration);
7. Statement of proposed Values policies to accomplish the Values objectives and, in so doing, to resolve the issues being discussed; and
8. Analysis of impacts of the proposed Values policies, reported for each of eleven goal areas.

To give an example, with urban transit financing as the issue, one might define the *status-quo objective* to be to increase nationwide transit ridership from its level of about 5.7 billion passengers in 1976, while also improving service from its 1976 level of 2.0 billion vehicle-miles.[11] This objective is related primarily to the goal of adequate service.

What if a different objective were to be sought, such as one that stressed operating efficiency for all modes in the urban market? This *Net Benefits objective* might seek to reduce operating costs per transit vehicle-mile from its 1976 nationwide average of about $2.13.[12] The answer would be a set of benchmark policies that would be different than the status quo. Impacts of the new policies would then be compared to those apparent from status quo policies.

The second set of benchmark policies is labeled the Values approach. These policies move away from the status quo in a different direction, one that gives less weight to Net Benefits, to pursue instead one or more goals other than efficiency. For example, transit issues might be resolved by *Values objectives* and policies that emphasize providing jobs (e.g., increasing the number of nationwide transit employees from its 1976 level of about 162,500)[13] or saving energy and protecting the environment. Values policies are likely to de-emphasize private actions or efficiency, although these considerations would not be ignored. For the Values approach, as for the Net Benefits approach, teams would define objectives, delineate policies, evaluate impacts and compare the results to the status quo.

Upon completion of their reports, the issue teams (one team for each market) met in June 1978 to discuss the proposals of their members for resolving the specific issues. Based on discussion, a team position evolved on the two alternatives (compared to the status quo) for each issue. At this stage, the NTPSC's policy development process mirrored much real-world policymaking. Policies were developed to treat individual issues without substantial regard for the interaction of policies within a market or the U.S. as a whole.

At the end of the first issue team meetings, participants ranked issues in terms of:

1. Relative adverse impacts of status quo policies;
2. Relative gain from implementing proposed Net Benefits policies;
3. Proper implementation sequence of recommended Net Benefits policies; and
4. Relative practicality of Net Benefits recommendations.

For the Values alternatives, items 2, 3 and 4 were repeated.

This ranking served to focus attention on policy proposals that might have great potential for improvement over the status quo, but were impractical as stated. Discussion then turned to how to modify proposals to be more practical, without diverting the potential benefits of the originals. Notably, many Net Benefits suggestions calling for proper economic, marginal-cost-based pricing were felt to be potentially beneficial, but lacking in practicality. These were modified to deal, wherever possible, in specifics that would be comprehensible to other policymakers. For example, rather than recommending across-the-board application of long-run marginal cost pricing, participants recognized that in the intercity freight market, for certain locks on the existing inland waterway system or for certain rail branchlines, short-run incremental pricing might be appropriate. Such prices would attempt to cover operating and maintenance expenses, supplemented with fixed license fees paid by users, and sometimes might be appropriate in terms both of economic efficiency and practicality.

It should be noted that the issue teams were not explicitly playing the role of policymakers or politicians. Instead, the teams were seeking to evaluate evidence objectively, so as to present to the Commissioners for their judgement consistent sets of policy. It was expected that the Commissioners would pick and choose from the Net Benefits and Values alternatives (indeed, they were not mutually exclusive) and insert new alternatives. On the other hand, it was recognized that the issues, policy alternatives and impacts under discussion would have some influence on the deliberations of the Commissioners. This meant that at each stage in the staff process, care was taken to seek a wide range of viewpoints, and to evaluate inputs from as objective a point of view as possible.

Following the *issue* phase of the NTPSC policy development process, and a review of minutes of the issue meetings by participants, another round occurred in which alternative *market* objectives, policies and impacts were considered, using a structure similar to that applied to issues. In this case, however, the products were sets of policies which transcended modes or issues, were to be consistent, and were concerned with systemwide interactions.

Following further review (augmented with additional comment from academics, consultants, government officials and several interest groups), alternative *national* policies were determined, again using a structure similar to that listed above for issues and market policies. Two final reviews prepared the recommendations for presentation to the Commissioners.

DETERMINING SYSTEM IMPACTS

Guided by a search of methods used in previous studies and of methods employed presently at agencies, firms and universities, NTPSC analyzed impacts of its policy alternatives using the eleven-goal format. NTPSC investigated existing policies and programs to obtain evidence about suspected gaps and conflicts.

Participants in the NTPSC policy development process also provided information on impacts for status quo, Net Benefits, and Values policy alternatives. The impacts were reported for all of the eleven goals, regardless of the stated goal of the policy or program. For example, every policy was examined for its impacts on transport safety, even though the expressed goal of the policy being examined was not safety.

Within each goal area, different impact indicators were used, depending on the judgment of the researchers and the availability of published evidence. For example, it is well known that the use of average energy efficiency alone is a poor method to compare the energy-saving potential of various policies. Instead, these averages should be used as a base from which adjustments are made for terrain, load factor, engine and other vehicle characteristics.[14] Researchers were encouraged to make such necessary adjustments and to specify the assumptions and techniques that were used to generate impact results. Where quantitative results could not be obtained, qualitative judgment was used, but once again researchers were asked to state explicitly their assumptions and analytic techniques.

Chapter 14 reports the results of NTPSC impact analysis of the policies chosen by the Commissioners to be recommended to Congress and the President.

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12. From calculations based on *Ibid.,* "Table 4 — Trend of Transit Expenses," p. 21 and "Table 11 — Trend of Passenger Vehicle Miles Operated," p. 30.

13. *Ibid.*, "Table 13 — Trend of Transit Employment,Compensation, and Labor Costs," p. 34.
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Additional Publications of the NTPSC

SPECIAL REPORTS

No.1 *Current Transportation Issues in the United States, Volume I: Executive Summary; Volume II: Issue Papers and Source Materials,* Report Nos. NTPSC/SR–78/01–A (Vol. I) and NTPSC/SR–78/01–B (Vol. II), Washington, D.C.: 1978. (NTIS Nos.: PB 290 372/AS (Vol. I); PB 290 517/AS (Vol. II).

No. 2 *Amtrak: An Experiment in Rail Service,* by Frank P. Mulvey, Report No. NTPSC/SR–78/02, Washington, D.C.: 1978. (NTIS No. PB 288 259/AS).

No. 3 *The Impact of Telecommunications on Transportation Demand through the Year 2000;* by the MITRE Corporation, METREK Division, Report No. NTPSC/SR–78/03, Washington, D.C.: 1978. (NTIS No. PB 290 833/AS).

No. 4 *State and Local Transportation Policies and Programs,* Report No. NTPSC/SR–79/04, Washington, D.C.: 1979.

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STAFF WORKING PAPERS

NTPSC working papers covering research in energy, technology, safety, regulation, financing, forecasts, policy development and various modal issues are also available from the National Technical Information Service. These papers document in substantial detail the research of the NTPSC staff and consultants.

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In an effort to seek broad public input, the NTPSC engaged in a series of public hearings and field inspection trips in the following locations: Altoona, PA, Atlanta, GA, Boston, MA, Camden, NJ, Cleveland, OH, College Station, TX, Denver, CO, Hartford, CN, Kansas City, MO, Los Angeles, CA, Marseilles, IL, Memphis, TN, Morris, IL, New Orleans, LA, New York, NY, Newark, NJ, Newport News, VA, Ottowa, IL, Phoenix, AZ, Pittsburgh, PA, Princeton, NJ, Providence, RI, Pueblo, CO, Seattle, WA, Seneca, IL, Springfield, IL, Streater, IL, Washington, DC, and Wichita, KA.

The Commission would like to gratefully acknowledge the following individuals and groups who participated in this effort.

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The Commission, as directed in its enabling legislation, worked closely with more than 60 Federal agencies during the course of its study. The NTPSC would like to gratefully acknowledge the following individuals representing these agencies for their assistance and cooperation.

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Glossary

AASHTO: American Association of State Highway and Transportation Officials.

Active Controls technology: A system of automatic controls on aerodynamic surfaces to reduce stress on wing or tail.

ADAP: Airport Development Aid Program: Provides airport development grants from the Airport and Airway Trust Fund for the ultimate purpose of establishing "a nationwide system of public airports adequate to meet the present and future needs of civil aeronautics."

AGT: Automated Guideway Transit: A class of transportation systems in which unmanned vehicles are operated on fixed guideways along an exclusive right-of-way.

Air carrier: One who undertakes, directly or indirectly, to engage in the operation of any aircraft in interstate, overseas, or foreign air transportation, or which transports U.S. or foreign-transit mail. Includes those operators who have been issued a certificate of public convenience and necessity by the Civil Aeronautics Board, i.e., certificated air carriers and supplemental air carriers. Commercial operators of large aircraft (over 12,500 pounds) are also classified as air carriers. See also Commuter Air Carrier.

Aldehyde emissions: A group of photochemically reactive organic chemicals that can contribute to smog formation. Acetaldehyde and formaldehyde are two typical members of the aldehyde family of compounds, all of which are characterized by the group CHO.

All-cargo carrier: One of a class of air carriers holding certificates of public convenience and necessity from the CAB authorizing the carriage by aircraft of only (i) property as a common carrier for compensation or hire, or (ii) mail, or both, in commerce within the U.S.

Amtrak: The National Railroad Passenger Corporation established by the Railroad Passenger Service Act of 1970. This Corporation now operates most of the intercity rail passenger service in the United States. It receives Federal financial support.

APTA: American Public Transit Association.

Appropriation (funds): At the Federal level, the process whereby Congress enacts a statute permitting expenditure of funds, sometimes repeatedly over a period of several years, for construction of authorized projects and implementation of authorized programs.

ARC: Appalachian Regional Commission.

Aromatic: An organic compound which contains at least one benzene ring.

ATAC: American Transportation Advisory Council.

Authorization: At the Federal level, the process whereby Congress enacts a statute approving construction of a project or implementation of a program, frequently specifying a maximum amount to be appropriated for the purpose (but not appropriating the required funds).

BART: Bay Area Rapid Transit (California).

BEA: Bureau of Economic Analysis (DOC).

Benefit-cost analysis: Comparison of the expected benefits of a transportation (or other) project with the anticipated costs of that project. Ordinarily, unless the computed benefits exceed the computed costs, the project is not considered economically desirable. (Also see: "cost effectiveness" and "discount rate".)

Bit: A unit of computer information equivalent to the result of a choice between two alternatives (as yes or no, on or off).

Block grant: Funds distributed to a jurisdiction which may be spent at its discretion.

BMCS: Bureau of Motor Carrier Safety (DOT).

Btu (British thermal unit): The amount of energy required to raise the temperature of one pound of water one degree Farenheit.

Bulk carrier: A class of marine vessels which is dedicated to the transport of bulk commodities.

CAB: U.S. Civil Aeronautics Board.

Capital: Funds used for investment in industry.

Capital grants: Funds designated for purchase of new equipment, right-of-way, etc., in contrast to operating and maintenance grants.

Carpool: A group of people who share their automobile transportation to designated destinations on a regular basis.

Catalytic convertor technology: An automotive pollution control device which uses an oxidizing catalyst (platinum) and a reducing catalyst to control HC, CO and NO_x emissions.

Categorical grant: Funds required to be spent for a specific project.

CBO: Congressional Budget Office.

CDS: Construction Differential Subsidy: The Construction Differential Subsidy program, Title V of the Merchant Marine Act, 46 U.S.C. Section 1151 *et seq.* (1975), is the major U.S. maritime construction subsidy. The amount of the subsidy is equal to the estimated cost difference between building a vessel in a U.S. shipyard and building it in a representative foreign yard.

CEQ: Council on Environmental Quality (Executive Office of the President).

Certificated air carrier: One of a class of air carriers holding certificates of public convenience and necessity, issued by the CAB, authorizing the performance of scheduled air transportation over specified routes and a limited amount of nonscheduled operations. This general carrier grouping includes the all-purpose carriers (i.e., the so-called passenger/cargo carriers) and the all-cargo carriers, and comprises all of the airlines certificated by the Board, except the supplemental air carriers. Certificated route air carriers are often referred to as "scheduled airlines" although they also perform nonscheduled service.

CO: Carbon monoxide: A clear odorless gas, results from the incomplete combustion of carbonaceous fuels. In high concentrations, it can be fatal. In lesser concentrations, it can be tolerated, but often at the expense of headaches, malaise, and a slowing of mental and physical activity. In addition to the direct health effects, the change of CO to CO_2 in the atmosphere might contribute over the long term to a warming of the earth's atmosphere with far reaching ecological consequences.

COG: Council of Governments: A voluntary organization of local governments usually formed to be responsible for comprehensive planning of an urbanized area, or metropolitan area.

Commuter Air Carrier: Operators of aircraft of a maximum size of 12,500 pounds payload, who perform at least five scheduled round trips per week between two or more points, or carry mail pursuant to contract with the U.S. Postal Service, and meet other requirements for air taxi operators under 14 CFR Section 298.3. They operate under 14 CFR Section 298, FAR 133, and, at times, FAR 121.

Composite materials: Materials which are composed of two or more distinct materials with specific functions which when acting together offer properties which cannot be achieved by the components acting alone. They are noteworthy in combining greater strength with lighter weight.

Concorde: The name given to the civilian supersonic transport built by the French and British.

Conrail: The Consolidated Railroad Corporation which resulted from the reorganization of eight bankrupt railroads in the 17-state Northeast and Midwest quandrant of the United States. It is now the nation's largest railroad. It receives Federal financial support.

Containers: Trailer-size boxes (in marine use, usually 8 feet square and 20–40 feet long) that are stuffed with cargo and sealed. The boxes are transportable by customized ship, train, or truck, and are lifted on or off the ships by means of specialized cranes.

Container ships: Vessels with a specially designed cellular structure for the transport of containers. The containers are lifted on and off the vessel with specialized cranes.

Cost-effectiveness: Comparisons of alternative ways to achieve a given objective in order to identify the least-cost way. To the extent practical, costs include all the costs to society of the alternative.

CSA: U.S. Community Services Administration.

CSP: Coal Slurry Pipelines: Pipelines designed to carry a slurry of coal particles suspended in water or other liquid from mineheads to destination points where the water is removed and the coal is used as boiler fuel, stored, or transloaded to another transportation mode.

CTA: Chicago Transit Authority.

CUTS: Community Urban Transportation Study.

Deepwater oil ports: An offshore port in water of sufficient depth to accommodate oil tankers over 140,000 deadweight tons. The facility consists of an offshore terminal for unloading, pipelines for transport to shore and onshore receiving facilities.

Dial-a-ride (demand responsive) transit: A transit system which is characterized by vehicles providing door-to-door service upon client telephone request or by appointment. There is a wide range of vehicle types which may be used: minibus, vans, etc.

Diesel Engine: An internal combustion engine in which air is compressed to a temperature sufficiently high to ignite fuel injected into the cylinder where the combustion actuates a piston.

DOC: U.S. Department of Commerce.

DOD: U.S. Department of Defense.

DOE: U.S. Department of Energy.

DOT: U.S. Department of Transportation.

Draft: The depth of water a ship needs to float in, especially when it is loaded.

Dredged and fill material: Dredging maintains ports at advertised depths and fill material is used to extend port facilities to handle increased cargo.

EEC: European Economic Community (Common Market).

EIS: Environmental Impact Statement.

Electronic correspondence: A transmission of information from one computer to another, designed at present primarily to record financial transactions.

Eminent domain: The right of a government to acquire a private property for public use, even from an unwilling owner, upon payment of compensation to the owner; occasionally conferred upon private entities vested with a public interest (such as utilities).

Emission standards: See National Ambient Air Quality Standards.

Emissions Offset Policy: EPA's December 21, 1976, interpretive ruling on growth in nonattainment areas. This ruling, which is continued by the 1977 amendments to the Clean Air Act, 42 U.S.C. Section 7401 *et seq.* (1979), Pub. L. 95–95, 91 Stat. 712, until July 1, 1979, requires that new emissions in such areas must be more than "offset" by concurrent emission reductions from existing sources in the area, leading by stated deadlines to a net improvement in air quality.

Energy Efficient Engine: NASA's program to develop technology for the next generation of high bypass ratio turbofan engines for subsonic transports.

Energy Recovery System: Any device which can recover energy from a system (often in the form of exhaust heat) which has previously been wasted and recycle that energy to increase system efficiency.

EPA: U.S. Environmental Protection Agency: The Federal agency responsible for controlling and abating pollution in the areas of air, water, solid waste, pesticides, noise, and radiation. Also, some states have established similar agencies.

EPCA: Energy Policy and Conservation Act of 1975, as amended, 42 U.S.C. Section 6295 (1977), Pub. L. 94–163, 89 Stat. 923.

Equity: The fair treatment of all affected parties; for example, the concern that the handicapped have full access to public transportation.

ERA: Energy Regulatory Administration (DOE).

ERDA: Energy Research and Development Administration: (Following creation of the U.S. Department of Energy in 1977, ERDA's functions were absorbed by various offices of DOE).

Externality (also external diseconomy): A harmful effect on one or more persons which stems from the activity of other persons or firms; the activity yields private benefits or advantages to the individuals or firms engaged in it but results in social costs, disadvantages, or economic penalties to others; the full social costs are not reflected in the prices paid and those harmed are not adequately compensated. Examples in transportation include:

1. harmful air pollution emitted by transportation;
2. other hazards imposed on pedestrians, bystanders, etc.;
3. congestion, delays, and costs imposed on others; and
4. irritating or annoying transportation noise.

FAA: Federal Aviation Administration (DOT).

Facsimile: The transmission of graphic matter (as printing or still pictures) by wire or radio and its reproduction.

FAR: Federal Aviation Regulation.

FAUS: Federal-Aid Urban Systems (highway or highway-related).

FEA: Federal Energy Administration. (Following creation of the Department of Energy in 1977, FEA's functions were absorbed by various offices of DOE).

FERC: Federal Energy Regulatory Commission: An independent commission administratively attached to DOE.

FHWA: Federal Highway Administration (DOT).

FMC: U.S. Federal Maritime Commission: The independent Federal agency responsible for the economic regulation of waterborne foreign and domestic offshore commerce of the United States.

FRA: Federal Railroad Administration (DOT).

FRC: Federal Regional Commissions: Authorized under Title V of the Public Works and Development Act of 1965, as amended, 42 U.S.C. Section 3181 (1977), Pub. L. 89–136, 79 Stat. 564; the Commissions promote and manage the development of multistate regions designed by the Secretary of Commerce upon a finding of economic and social need. At present, there are eight such commissions.

For-hire trucking: The movement of freight for compensation by highway. Examples of for-hire motor carriage include regular and irregular route common carriers, contract carriers, and carriers of exempt agricultural commodities.

Formula grant: A grant to a state based on such factors as population or land area and, as regards transportation, in support of highways, airports, or mass transit.

GAO: U.S. General Accounting Office.

Gas turbine engine: A continuous combustion, 3 cycle engine: 1) incoming air is compressed by rotary compressor, 2) internal pressure is raised by combustion of fuel, 3) high pressure air and combustion products are expanded through a turbine, driving the propulsion chain.

General aviation: All civil aviation activity except that of certificated, supplemental and commuter air carriers. General aviation includes:

1. *business flying*—any use of an aircraft not for compensation or hire by an individual for the purposes of transportation required by a business in which he or she is engaged;
2. *contract operators*—an air carrier operating on a private for-hire basis, as distinguished from a public or common air carrier, holding a commercial operator certificate (issued by the FAA under FAR 121) authorizing the carrier to operate aircraft under 12,500 pounds for the transportation of goods or passengers for compensation or hire;
3. *executive aviation*—any use of an aircraft by a corporation, company or other organization for the purposes of transporting its employees and/or property not for compensation or hire and employing professional pilots for the operation of the aircraft; and
4. *personal aviation*—any use of an aircraft for such personal purposes as learning to fly or recreation.

Goal: A desired end. (Example: "The development of comprehensive and coordinated mass transportation systems, both public and private, in metropolitan and other urban areas . . .". UMTA Act.)

gpm: grams per mile: Unit measure for five criteria air pollutants regulated by U.S. Environmental Protection Agency.

GNP: Gross National Product: The value of the goods and services produced by the United States each year. It may be estimated two ways:

1. The sum of all wages, indirect business taxes, rents and profits;
2. The sum of all personal consumption expenditures, investment, net exports and government expenditure.

Guideway: A supporting physical structure which physically constrains the travel direction of transit vehicles operating in or upon it.

HC: Hydrocarbon air pollutants. Incomplete combustion of fuels and evaporation of fuel from tanks and elsewhere introduce hydrocarbons into the atmosphere. Hydrocarbons are emitted from natural sources as well as man-made ones, but the technological contribution may raise HC concentrations to harmful levels. Areas of the country vary widely in their natural and manmade sources of HC emissions. In sufficient strength, some HC's irritate the upper respiratory tract and skin and damage plant life.

The HC national ambient air quality standard is not a primary standard, designed to protect the public health; it is a reference standard for controlling photochemical oxidant levels, of which HC is a precursor.

HIAP: Highway Investment Analysis Package: A set of computer programs designed by DOT to assess the value of highway improvements.

Household formation rate: Rate at which people establish independent living quarters.

HRB: Highway Research Board: Predecessor to the Transportation Research Board. An agency of the National Research Council established in 1920 to stimulate highway research, it was replaced in 1974 by the Transportation Research Board.

HUD: U.S. Department of Housing and Urban Development

HUIS: Highway User Investment Study: A 1972 study by DOT on benefits and costs of highway investments.

Hybrid vehicles: A vehicle that combines a relatively small heat engine, which is almost always operated near its peak efficiency, with a reversible energy storage system (such as a battery or flywheel) to handle sudden power demand peaks.

IATA: International Air Transport Association: Voluntary organization open to any scheduled air carrier whose home country is a member (or eligible to be) of the International Civil Aviation Organization (ICAO).

ICAO: International Civil Aviation Organization: Specialized agency of the United Nations composed of contracting states to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport.

ICC: U.S. Interstate Commerce Commission.

IMCO: Inter-Governmental Maritime Consultative Organization: A United Nations sponsored organization, which establishes voluntary environmental and safety standards for marine transportation.

Impact: Effect of actions. (Example: Secretary Adams' Transbus decision should affect elderly and handicapped users, transit operating authorities, bus manufacturing firms, employees of these firms, etc. Measuring or predicting these impacts involves a search for specific estimates of both costs and benefits, and the groups that experience these, so that an assessment of net benefits can be made.)

Inforum: A national-level input-output model with 200 industrial sectors to describe the U.S. economy.

INSA: Inland Navigation Systems Analysis

Intercity market: Transportation between U.S. urban places of at least 2,500 population, as well as interstate transportation generally.

Intercity transportation: Not rigorously defined. In general, travel originating in one city and ending in another. Sometimes SMSAs, urbanized areas, or urban areas are used instead of cities. Sometimes intercity travel statistics include all travel not accounted for within urbanized areas (or SMSAs or urban areas).

Intermodal: A transfer of goods or passengers from one mode to another, as from plane to train, during the course of a trip; also, competition between modes.

International marine traffic: Movements between the United States and foreign countries, (and between Puerto Rico, the Canal Zone and the Virgin Islands, and foreign countries). Trade between U.S. territories and possessions (i.e., Guam, Wake) and foreign countries is excluded.

International market: Carriage of passengers and goods across national boundaries, but excluding traffic moving between domestic points via international routes.

International transportation: In general, transportation which crosses international boundaries.

Interstate compact: In the case of transportation, agreements between two or more states for dealing with problems involving more than one state and beyond the legal authority of one state alone to solve. Such agreements require the consent of Congress. The Federal government may participate in some compacts, in which case the agreement is called a Federal-interstate compact.

Intrastate air carrier: A carrier licensed by a state to operate wholly within its borders and not permitted to carry interline passengers from out of state. They are not regulated by the CAB.

Issue: Sharp disagreement. (Example: Local governments and transit operators are divided on the degree to which fully accessible regular transit service or special services should be provided to elderly and handicapped groups).

Joint costs: The costs of those parts of a transportation (or other) activity which cannot be isolated as to a single purpose. For example the cost of a rail right-of-way serving both public passenger and freight services (See "multiple use").

Land bridge: An intermodal transfer of goods across water and then across land (a minibridge) and possibly across water again (a maxibridge).

Line-haul: Operations (generally express) along a single corridor or variety of corridors, as distinguished from collection or distribution at a more local level.

LNG: Liquified Natural Gas.

LOOP: Louisiana Offshore Oil Port.

MarAd: Maritime Administration (DOC).

MARTA: Metropolitan Atlanta Regional Transportation Authority.

Mobile source pollutant: EPA-defined pollutants, primarily air and secondarily noise, emitted by the operation of motor vehicles. Three air pollutants attributed primarily to mobile sources are presently regulated by EPA: HC, CO, and NO_x. Noise is regulated according to the intensity or level of the sound.

MPO: Metropolitan Planning Organization.

NACo: National Association of Counties.

NASP: National Airport System Plan: Plan developed by the FAA and revised in accordance with the requirements of the Airport and Airway Development Act of 1970, as amended, 49 U.S.C. Section 1712 (1976), Pub. L. 91–258, 84 Stat. 220, to identify the type and amount of airport development necessary to serve the needs of civil aviation, national defense, and the U.S. Postal Service.

National Ambient Air Quality Standards: EPA, to comply with the requirements of the Clean Air Act of 1970, Pub. L. 91–604, 84 Stat. 505, established standards of permissible concentrations of sulfur dioxide, particulate matter, carbon monoxide, and nitrogen dioxide. A standard was also established for hydrocarbon levels for use only as a guideline for the control of photochemical oxidants. Primary standards protect the public health, while secondary standards protect public welfare.

NEM: National Energy Model: The National Energy Model forecasts for the period from 1975 to 2000: energy production in 11 domestic supply regions; imports; the conversion of energy; and consumption in the 9 U.S. Census regions. The associated prices at each level (for each energy product in each region) are also presented.

NEPA: National Environmental Policy Act of 1969: 42 U.S.C. 4321 *et seq.* (1977), Pub. L. 91–190, 83 Stat. 852. The first major Federal act to establish a policy for the environment; also, it established the Council for Environmental Quality.

NGA: National Governors' Association.

NHTSA: National Highway Traffic Safety Administration (DOT).

NLC: National League of Cities.

NOAA: National Oceanic and Atmospheric Administration (DOC).

Noise: Noise, as pollution, is usually defined as unwanted sound. Sound can be described in terms of magnitude and frequency over time, but its annoyance potential is a subjective quality that defies simple measurement. Sounds have a wide range of irritating characteristics, and because of the difficulty in comparing annoyance on a common scale, several measures of important factors are used.

Sounds travel through the air in the form of small waves of air pressure fluctuations. It is measured in decibels (dB), a quantity of sound wave energy. Because decibels are a logarithmic function, an increase of 10dB is equivalent to doubling the loudness. Because the human ear is not equally sensitive to all frequencies of sound, a scale has been devised to weight the sound level at each frequency band according to its perceived loudness. The resulting measure is equivalent to the human ear response to sound, expressed in A–weighted decibels, dB(A) scale; it is best used in describing rather continuous sources of noise.

To gauge noise effectively, several scales have been developed for the effects of separate noise events. For measuring the noise level of individual aircraft flyover events, the effective perceived noise level (EPNL, measured in EPNdB) incorporates several more factors that contribute to perceived annoyance. Another level of sophistication is the noise exposure forecast (NEF), which attempts to measure the cumulative noise effect of aircraft operations. The NEF is used by land-use planners to describe areas adjacent to airports that are exposed to high levels of cumulative noise. For example, an NEF value of 40 generally indicates that a high percentage of people would be annoyed by the noise. Consequently, land within the 40 + NEF noise contour is not considered suitable for residential use.

Nonattainment area: An area of the country which is shown by monitored data or which is calculated by air quality modeling to violate a National Ambient Air Quality Standard.

NOx: Nitrogen oxide air pollutants are formed by atmospheric combustion. Natural background levels in the atmosphere exist; however, continued human exposure at very much higher concentrations tends to increase the risk of upper respiratory disease.

Oxides of nitrogen may also cause dyes and paints to fade, and combined with water vapor can corrode metals and produce other negative consequences.

NRC: U.S. Nuclear Regulatory Commission.

NSF: National Science Foundation.

NSLC: National Conference of State Legislatures.

Objective: Specific statement of a goal. (Example: "Passenger rail service in the Northeast Corridor should be improved so that travel time between Washington, D.C. and New York, is no greater than 2 hours, 40 minutes, by 1981 . . .". Rail Revitalization and Regulatory Reform Act of 1976, Pub. L. 94–210, 90 Stat. 33.)

ODS: Operating Differential Subsidy: A maritime subsidy program administered by MarAd.

OECD: Organization for Economic Co-operation and Development: Composed of 24 member nations (including the United States), the OECD was established under a convention signed in Paris in 1960 for the purpose of promoting economic growth and development of member and non-member states and the expansion of world trade.

OPEC: Organization of Petroleum Exporting Countries.

OTA: U.S. Office of Technology Assessment: Was created by the Technology Assessment Act of 1972, 2 U.S.C. Section 471 *et seq.* (1977), Pub. L. 92–484, 86 Stat. 797, to help the Congress anticipate, and plan for, the consequences of uses of technology.

Ozone: A triatomic form of oxygen that is a bluish gas of pungent odor. It is formed naturally in the upper atmosphere by a photochemical reaction with solar ultraviolet radiation and is a major agent in the formation of smogs. Standards set by EPA for photochemical oxidants control ozone levels.

Paratransit: Forms of public transportation services that are more flexible and personalized than conventional fixed-route, fixed schedule service but not including such exclusory services as charter bus and exclusive-ride taxi; vehicles are usually available to the public on demand, by subscription, or on a shared-ride basis.

Particulates: A form of air pollution consisting of fine grains of solid matter. Transportation's contributions are usually considered small, relative to the amounts emitted from other sources. Particulates have been associated with infections in the upper respiratory tract. Some scientists feel there is evidence that they also may affect precipitation patterns and other climatological conditions.

Passenger-miles: A commonly used measure of passenger travel. Unless otherwise specified, it is usually actual miles traveled or forecast times the number of passengers carried for each segment. A considerable amount of travel involves trips that start and return to intervening stops. In specified cases, passenger-miles may be estimates of actual miles traveled or straight-line distances between origins and destinations multiplied by the number of persons traveling between these points.

Care should be taken in comparing passenger miles by different modes. Speeds, reliability, frequency of service, comfort and convenience, and other attributes of the service are not reflected in this measure used alone. Furthermore, the travel purposes, affluence of travelers, and time values of passengers of different modes may be different.

Pipeline: A line of pipes with pumps, valves, and control devices for conveying liquids, gases, or finely divided solids.

Policy: A guide for choice. (Example: "It is hereby declared to be national policy that . . . special efforts shall be made in the planning and design of mass transportation facilities and services so that the availability to elderly and handicapped persons of mass transportation which they can effectively utilize will be assured . . .". UMT Act.)

Policy conflict: Contradictory directions (in statute or regulation).

Policy gap or inconsistency: Similar transportation activities not subject to similar policies or programs. (Example: Congress has required recipients of UMTA's transit grants to institute half-fare programs for elderly and handicapped persons during off-peak hours. National Mass Transportation Assistance Act of 1974, 49 U.S.C. Section 1604(b) (1976), Pub. L. 93–503, 88 Stat. 1565. No such requirements exist for other modes.)

Port: A physical connection of harbors, connecting channels, and waterfront/terminal facilities provided by a public body or private enterprise to transfer goods between waterborne and inland carriers and/or land functions.

Private trucking: Movement of freight owned by a firm, in trucks owned or leased by the same firm, and not for compensation or hire.

Program: A set of actions. (Example: "In addition to the grants and loans otherwise provided for under this Act, the Secretary is authorized to make grants and loans . . . to private nonprofit corporations (to assist) them in providing transportation services meeting the special needs of elderly and handicapped persons. UMTA Act.)

PUC/PSC: Public Utility (Service) Commission.

Quad: A measure of energy equivalent to one quadrillion (10^{15}) Btu. 1 Quad = 172.4 million barrels of crude oil, or 42.55 million short tons of coal, or 979.4 billion cubic feet of natural gas.

Rail rapid transit: Passenger trains propelled by on-board electric motors drawing power from a third rail or other external power source. Has exclusive right-of-way and platform loading at stations.

Rationalization: To make orderly and explicit; as applied specifically to railroads, it means to improve efficiency through restructuring of lines.

Region: Made up of more than a single political or legal jurisdiction. The term may refer to: 1. urbanized areas; 2. Standard Metropolitan Statistical Areas; 3. Title V Economic Development Regions; 4. The Applachian Regional Commission Region; 5. ten Federal Multi-State Regions; 6. water basin areas; and/or 7. U.S. Department of Commerce Bureau of Economic Analysis Areas.

Regulation: The establishment, implementation, and enforcement of rules or restrictions by a government which foster, protect, adjust, control or restrain persons or property within its jurisdiction. In the area of interstate commerce, this exclusive authority is given to Congress. Article I, Section 8, Clause 3 (the Commerce Clause) of the Consitution. At the state and local levels, this authority is an inherent police power.

Residual Fuel: Viscous fuel that remains after the removal of valuable distillates (such as gasoline) from petroleum. It is used especially by industry. (Also called resid.)

Retrofit: To furnish with new parts or equipment not available (or not required) at the time of manufacture.

RFF: Resources for the Future.

Roll-on/Roll-off: An efficient system for loading and unloading a ship, in which vehicles or trailers are driven onto and off of the vessel by means of side ports and ramps.

RSPO: Rail Services Planning Office (ICC).

RTA: Regional Transportation Authority (Chicago).

Rural: *See* Urban and rural areas.

Rural market: Transportation between and within places of less than 2,500 population.

Rural transportation: Not rigorously defined. In general, transportation within a rural area. In some cases, intercity transportation which crosses the rural area may be netted out to prevent double counting.

Scenarios: Different technically possible futures. In this report, three scenarios (reflecting low-, medium- and high-growth) were used as part of NTPSC's transportation forecasting process.

SEA: Selective Enforcement Audits.

Slow-speed diesel engine: A marine engine in which the engine crankshaft is connected directly to the propeller shaft, eliminating the need for a transmission. Engine speeds are restricted to between 80 and 120 revolutions per minute.

"Soft" technology: Used in this report to mean more efficient use of available technology.

STA Act: Surface Transportation Assistance Act of 1978: Pub. L. 95–599, 92 Stat. 2689, codified in various sections of titles 15, 16, 23, 26, 40, 42, 46, and 49 of the U.S.C.

Standard Metropolitan Statistical Area (SMSA): The entire territory of the United States has been classified by the Office of Management and Budget as (a) metropolitan, or inside SMSAs, and (b) nonmetropolitan, or outside SMSAs. An SMSA is a county or group of contiguous counties (except in New England) which contains at least one central city of 50,000 inhabitants or more or "twin cities" with a combined population of at least 50,000. Other contiguous counties are included in an SMSA if, according to certain criteria, they are essentially metropolitan in character and are socially and economically integrated with the central city. In New England, towns and cities are used in defining SMSAs. Central cities are those named in the titles of the areas. For details and a listing of the component areas, see Bureau of the Budget (now Office of Management and Budget), *Standard Metropolitan Statistical Areas.*

State Implementation Plan (SIP): Each state is required to submit, for EPA's approval, an implementation plan outlining the state's strategy for attaining and maintaining the national ambient air quality standards within the deadlines established by the Clean Air Act.

Stationary source pollutant: EPA-defined "pollutants", primarily air and water, emitted from a stationary industrial, utility, commercial or other source. Two air pollutants attributed primarily to stationary sources are presently regulated by EPA: SO_2 and particulates.

Status quo objective: Implicit or explicit statement of an objective in existing policies and programs.

Stirling engine: An external-combustion piston engine, that is characterized by a continuous combustion process in which the heat from the ignited air-fuel mixture is transfered to a separate closed system containing a non-condensable working fluid such as helium, which is alternately cooled during compression and heated during expansion, producing motive power.

Stratified charge spark-ignition engine (Otto engine): A spark-ignition cycle engine in which the air/fuel ratio in the comnbustion chamber is much richer near the spark plug than elsewhere.

Subsidy: An annual government expenditure minus annual user charge receipts. Federal, state and local governments may subsidize. As used here, it does not include external diseconomies, or preferential treatment accorded by governments in the form of operating rights or constraints, cargo preference, help in international matters, etc., which may have similar effects.

Supercritical wing design: NASA designation for an airfoil design which is specially shaped to diminish the strength of the drag-inducing shock wave that occurs between regions of supersonic and subsonic airflow. A similar design is the "transonic" wing.

Synthetic liquid fuel: Produced from coal or oil shale which has been chemically processed to duplicate petroleum crude oil and then refined into traditional liquid fuels such as gasoline, middle distillates, or residual fuel.

TAA: Transportation Associations of America

TCP: Transportation Control Plan.

Teleconferencing: Any form of conference where parties are remote from each other, for example, one in which the participants communicate by telephone (or speaker phone), sometimes accompanied by a televised broadcast of the participants.

"3C" planning requirements: Cities with more than 50,000 population must maintain a continuing, comprehensive, and cooperative transportation planning process as described in 23 U.S.C. 134.

"13c" requirements: Section 13(c) of the UMTA Act provides that as a condition of any financial assistance granted under the Act, fair and equitable arrangements are made, as determined by the Secretary of Labor, to protect the interests of employees affected by such assistance, including preservation of rights under existing agreements, continuation of collective bargaining rights, protection of individual employees against a worsening of their employment positions, employment assurances to employees of acquired systems, reemployment rights, and paid training or retraining programs.

TIP: Transportation Improvement Program: A federally required listing of all public transportation projects proposed for implementation within the next five years within an urbanized or metropolitan area.

Ton-miles: A commonly used measure of freight movement activity; equivalent to moving a ton of freight, by any means, one mile.

TRANS: Transportation Resource Allocation Study: A series of computer programs developed under FHWA sponsorship to simulate highway and transit use in urban areas at different levels of investment.

Transbus: A new bus which meets Federal design specifications for low floor height and higher ramps or lifts for wheelchairs.

Transportation: In general the movement of people and goods. However, a number of exceptions may be implied. Possible example exceptions include: water by pipe, or natural or manmade watersheds; sewage transport in sewers, etc.

Transportation bill: This measure shows what the nation paid, or an estimate of what it would pay, in its market for transportation. For commercial transportation, it is the sum of revenues of the operators. For private transportation, it is the sum of costs associated with ownership and operation. It includes government expenditures not recovered through user charges. It does not include external costs.

TRB: Transportation Research Board: Is an agency of the National Research Council, which serves the National Academy of Sciences and The National Academy of Engineering. The Board's purpose is to stimulate research concerning the nature and performance of transportation systems, to disseminate information that the research produces, and to encourage the application of appropriate research findings.

TSM: Transportation Systems Management.

Turbofan: A fan in a jet engine that is driven by a turbine and is used to supply air for cooling, ventilation, or combustion.

UMTA: Urban Mass Transportation Administration (DOT).

UMT Act: Urban Mass Transportation Act of 1964: 49 U.S.C. Section 1601, *et seq.* (1976), Pub. L. 88–365, 78 Stat. 302.

UNCTAD: United Nations Conference on Trade and Development. This conference of vessel operators developed a draft "Code of Conduct" for international marine liner conferences.

Uniform charge spark ignition engine (Otto engine): A spark ignition internal and intermittent combustion engine which burns a uniform mixture of air and fuel, usually provided by a carburetor. The engine is characterized by reciprocating pistons with four cycles: intake, compression, ignition, and exhaust.

Unit train: A dedicated set of rail vehicles (a train) loaded at one origin, unloaded at one destination each trip, and moving in both directions on a predetermined schedule.

Urban and rural areas: According to the 1970 census definition, the urban population comprises all persons in (a) places of 2,500 inhabitants or more incorporated as cities, villages, boroughs (except Alaska), and towns (except in New England, New York, and Wisconsin); (b) unincorporated places of 2,500 inhabitants included in urbanized areas (statistics of the Federal Highway Administration of the U.S. Department of Transportation use 5,000). The population not classified as urban constitutes the rural population.

Changes in the size of the urban population from one census to another are affected by two components: (a) growth in areas classified as urban at the beginning of the decade; and (b) reclassification of rural territory as urban and urban territory as rural. Between censuses, it is possible only to obtain measures of the first component from the Current Population Survey. Measures of the second are too costly. About 60 percent of the urban population growth between 1950 and 1960 was attributable to expansion of urban territory.

Urban market: Transportation within places of at least 2,500 population, including daily commutation from surrounding areas.

Urban transportation: Not rigorously defined. In general, transportation within an urban area. In some cases, portions of intercity transportation which take place in urban, urbanized, or SMSA areas may be netted out to prevent double counting.

Urbanized area: An urbanized area is a central city over 50,000 in population plus the contiguous portion of its suburban fringe. The key element in this definition of "urbanized" is that the population density is above 1,000 persons per square mile, i.e., the circumferential boundary extends outward to the perimeter beyond which the population density falls below 1,000 persons per square mile. Thus, the boundary is statistically determined and does not correspond to political boundaries. The boundaries are redefined after data are available from each decennial census.

This differs from SMSAs. SMSA boundaries lie along county lines. In general, SMSAs encompass more land area than the corresponding urbanized area.

The urbanized area statistics from the 1974 National Transportation Report used by the National Transportation Policy Study Commission in its modeling and forecasting differ from the above definition in several ways. For the 1974 National Transportation

Report the boundaries of the 1970 urbanized areas were adjusted by 1990. All data for the period relate to the 1990 boundaries. This adjustment in some states causes the coalescence of closely located areas into a single large area, in those instances where the merged 1970 urbanized areas coincided closely with what the state or local planning agency considered to be a logical planning unit. Examples of merged areas are New York, Los Angeles, and San Francisco. Additional exceptions were made in three states—Alaska, Vermont, and Wyoming—which had no urbanized area in 1970. These states were asked to designate their largest city for urbanized area reporting i.e., Anchorage, Burlington, and Cheyenne, respectively. Thus the 1974 NTR includes reports from 241 urbanized areas in contrast to the 248 listed in the 1970 census.

USCG: U.S. Coast Guard (DOT).

USCM: U.S. Conference of Mayors.

User charge: A charge made upon direct beneficiaries (users) of a transportation activity, designed to recover part or all of the governmental cost (or social cost) of the project.

U.S.-flag carrier: One of a class of air carriers holding a certificate of public convenience and necessity issued by the CAB, approved by the President, authorizing scheduled operations over specified routes between the United States (and/or its territories) and one or more foreign countries.

U.S.-flag ship: A vessel manned by U.S. citizens, and owned and operated by a U.S. company. In the case of vessels receiving Federal subsidy, the ship must be built in the United States.

USRA: United States Railway Association.

UTCS: Urban Transportation Control System.

Values objectives: Those objectives which reflect goals other than strict economic efficiency; examples are the concern with safety and pollution.

Van Pools: A method of ride-sharing where groups of riders having a common origin or destination travel in stationwagons or vans. Generally used for commuting to places of employment.

VMT: Vehicle-miles traveled.

WMATA: Washington Metropolitan Area Transportation Authority.

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☆U.S. GOVERNMENT PRINTING OFFICE: 1979 O—293–620

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385.0973N2132N C001
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